

# CAR ACTION

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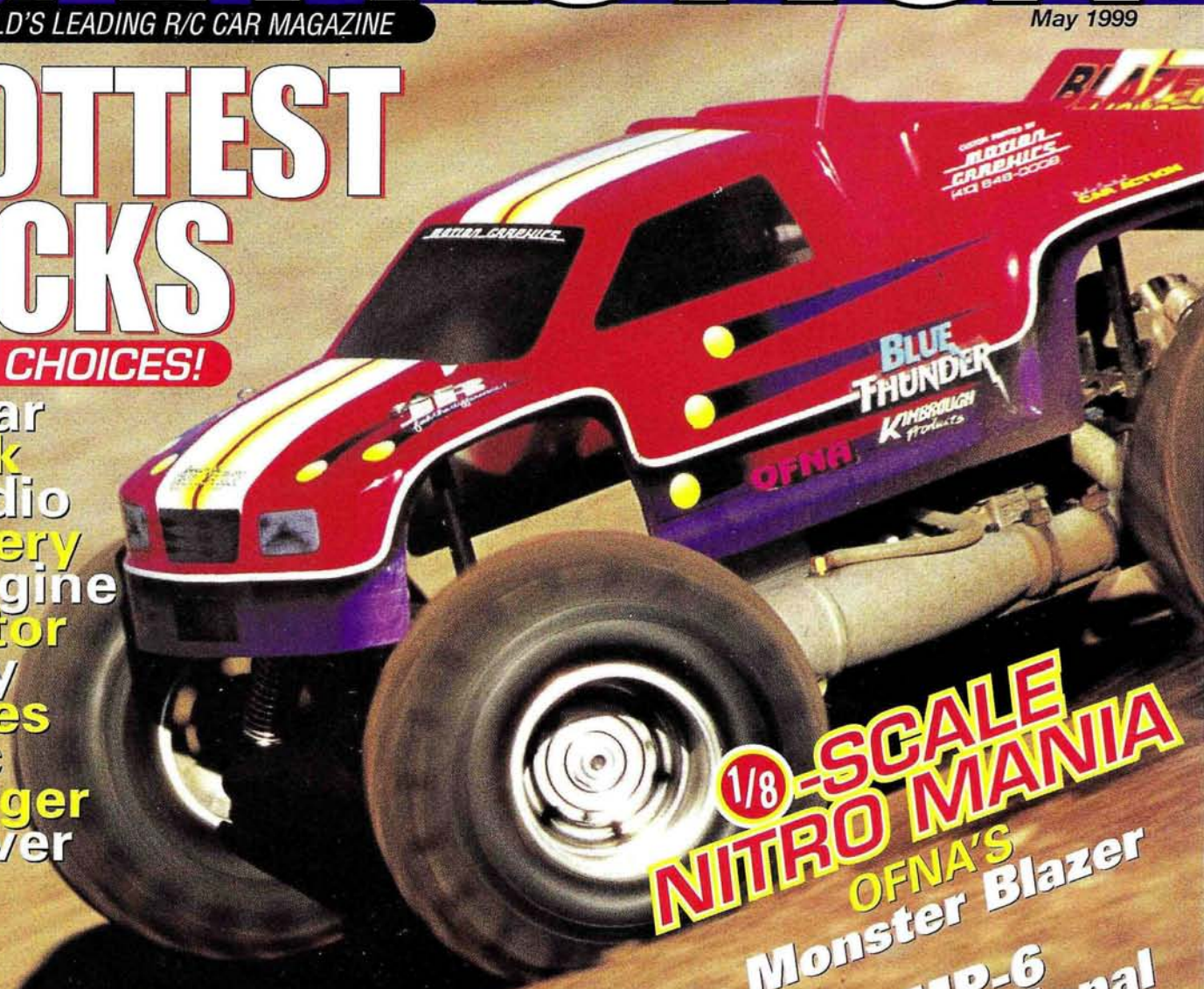
THE WORLD'S LEADING R/C CAR MAGAZINE

May 1999

## HOTTEST PICKS

**YOUR CHOICES!**

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## The people have spoken!

The ballots are in, the votes have been tallied; the envelope, please! The hobby's toughest critics (you) have made their choices, and we proudly salute the winners of our **1999 Readers' Choice Awards.**

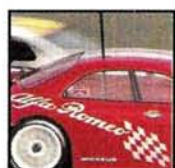
Did your personal picks win? Some familiar products were winners again, but there were a few upsets, too; check it out!



If we establish a category for "favorite project vehicle," Greg Vogel's wild 'n' woolly **Project Dual Engine USA-1** is sure to be a front-runner. If you've ever wondered what it would take to shoehorn a pair of powerhouse .21 engines into a monster truck, this two-part saga is your article.

Once completed, expect this truck to surpass the national speed limit!

Now that rebuildable stock motors have become popular, more and more racers are adding another piece of high-tech gear to their arsenal: a commutator lathe. With the influx of new lathes on the market, it can be difficult to choose one. We empathize, and we have just the info you need to make an informed choice with our **Motor Lathe Guide.** It's a must-read.



One of R/C car-dom's most anticipated releases has been the RS4 Pro follow-up, and this month we take an exclusive look at the new **HPI RS4 Pro 2.** OK, so the name isn't that exciting; trust me, the car is! Senior Editor George Gonzalez takes the wheel first (lucky).

And, as always, there's plenty more exciting stuff in *Radio Control Car Action*. Check out Kyosho's new super-buggy, the MP-6 International. Feast your eyes on Greg Vogel's dual-.21 engine USA-1 project monster truck. Get the latest race action from the Reedy Race of Champions, plus Thrash Tests, helpful how-to info, product reviews and more. Dig in, and let us know what you think!

*Peter Vieira*

Peter Vieira  
Editor

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100 East Ridge, Ridgefield, CT 06877-4606, USA



## Fun, Fun, Fun

You invited a response to your interview with Cliff Lett ("Racer News," March 1999), so here it comes: even after owning a few cars, I still consider myself a new-comer to R/C. I agree with Cliff concerning the rising costs of this hobby. After all, it is just that—a hobby. I am in the hobby for the sheer fun of building, painting and upgrading my cars and trucks. I would like to see more articles on the *fun* of R/C; that's the reason we all got into this hobby in the first place. Let's face it: building the car, carefully laying down the paint, seeing it zip down the street for the first time, zooming past your buddy's car in the park ... those little thrills are the real joy of this hobby. [email] JOHN HAUSER

## Bunny Slippers

I just wanted to write and say the monster truck shootout article (March 1999) rocked! I was thinking about getting a Kyosho HiRider II, but I'm worried that I'll have problems because there's no slipper clutch. How important is it to have one? ROGER "RABBIT" PRESS  
Chester, PA



Rog, most of the monster trucks we tested were slipper-less; it's no biggie, especially with the mild stock motors used in the kits. Even with stronger modifications, you shouldn't experience tranny problems unless you go out of your way to beat on the gearbox. Monster trucks are usually run off-road, where there's enough "give" from wheelspin to protect the transmission. An ESC with reverse delay or "smart"

brakes can also help protect your gearbox. The HiRider II uses the old Ultima gearbox, and it's practically bomb-proof. As long as you drive with a little common sense, it will last forever. —Pete

## Do they Make it in Blue?

Hey George, well done on the "How to set up the HPI RS4 MT for off-road racing" article in the March issue; I now have something to aim for. One question, though: where did you get the purple-anodized front arm brace? And do you know if it's available in blue? [email] WATTS

The front arm brace used in that article was from HPI. It's basically the same unit as comes with the RS4 Pro 2 and the Nitro RS4 RTR vehicles; I'm sure you can order one from your hobby-shop dealer. As far as a blue-anodized brace is concerned, you might want to call Savon Hobbies at (305) 634-8959, or Bruckner Hobbies at (800) 288-8185. Both import many goodies for the HPI Nitro RS4, which uses the same front arm brace. Good luck.

—G-Man

## Rally or Sport?

I recently got into the R/C touring-car scene and decided that I wanted to get an HPI RS4 Sport. When I went to my local hobby

shop to order it, though, the owner said the new HPI RS4 Rally had just come in; he told me that it can go off-road and be lowered for competitive touring with the appropriate tires. He said it will out-handle many dedicated touring cars! In addition to its performance, the Rally kit comes with a bearing set that would be about \$30 extra with the Sport. Should I order the Rally kit with the hope of having a car that would not only be great

off-road, but would also be a great touring car? And are there any hop-up parts that I should get to better the performance of this car? By the way—great magazine! [email] STEVE

With its complete ball-bearing package, the HPI RS4 Rally is an excellent deal, and it's quite versatile. But be aware that the reason it handles so well is that it is 200mm wide. The wider car handles much better than its 190mm counterparts, but some tracks only allow 190mm cars to participate in electric touring-car races, and this would put you out of the running unless you invested in shorter dogbones to convert the Rally to 190mm. If you just want to play with the car, or your local track allows you to run a 200mm car, then don't think twice; the RS4 Rally is a blast. As far as hop-up options go, just about any RS4 hop-up will work on the car. The heat-sink motor plate is good to have, and other upgrades can help its performance as well as its esthetics. Have fun, but remember: you don't have to go wild. The car works well in stock trim, and as you noted, it already includes must-have hop-up: bearings. —Greg

## Hall of Famer Rod Carew (he converted)

I was wondering how hard it would be to convert my ...

... HPI Nitro RS4 to a Super Nitro RS4.  
NICK HEIDEL  
Chino, CA

... HPI Nitro Mini RS4 to a Super Nitro RS4.  
RAY LAMBERT  
Aurora, CO

... HPI RS4 Pro to a Super Nitro RS4. [email] CHUCK JOYCE

Gee, you didn't happen to see the review of the Super Nitro RS4 in the March issue, did you? Thought so. Now, people: although all these cars share

**WRITE TO US!** We welcome your photos, drawings, comments and suggestions. Letters should be addressed to "Letters," Air Age Inc., *Radio Control Car Action*, 100 East Ridge, Ridgefield, CT 06877-4606. Letters may be edited for clarity and brevity, and each must include a full name and address or telephone number so that the identity of the sender can be verified. We regret that, owing to the tremendous numbers of letters we receive, we can't respond to every one.

### INTERNET ADDRESSES:

Chris Chianelli: [chrisc@airage.com](mailto:chrisc@airage.com)  
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Peter Vieira: [peterv@airage.com](mailto:peterv@airage.com)  
Greg Vogel: [gregv@airage.com](mailto:gregv@airage.com)

some parts, converting one into another is simply not cost-effective. You'll spend a whole lot of money, and you'll end up with one car and a big pile of spare parts. The only thing you should take out of one car to put into another is radio gear, so just buy the doggone Super Nitro RS4 and be done with it! —Pete

## R/C Monkey on your Back

I really love R/C, but think I'm addicted to it; is that possible? I work on my car all the time, and it's all I think about. I have trouble concentrating on anything else, and sometimes, the teacher busts me for reading *R/C Car Action* in class. I don't want to be "cured," but I'm curious to know what you think.  
HARRISON BRODY  
West Olive, MI

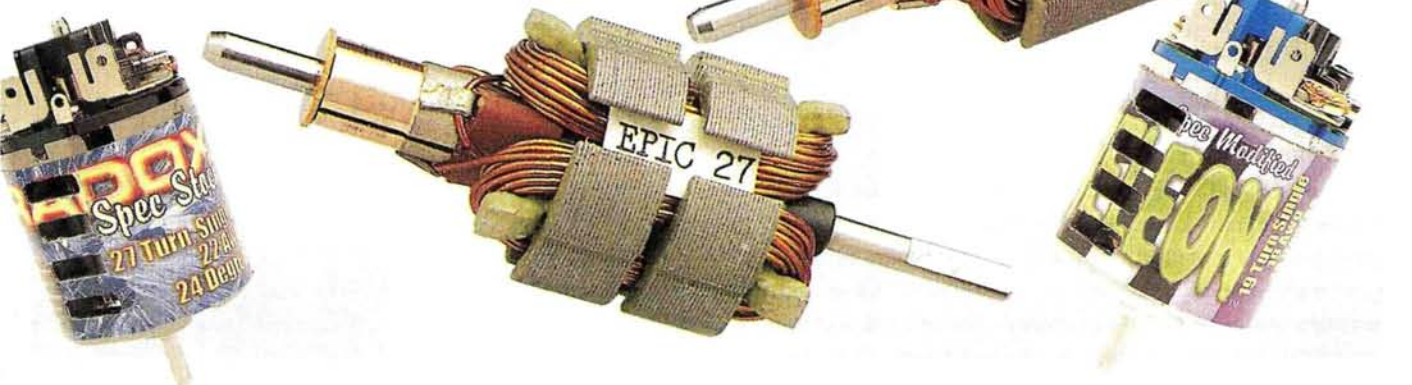
Harry (can I call you Harry?), you need to channel that energy. Start looking at your science and math classes as a way to learn more about R/C; after all, physics and geometry are critical for understanding how cars work. In English class, use creative writing assignments to tell your favorite R/C tales; I prefer horror stories such as *The Glitch That Wouldn't Die* and *The Time I Dropped All My Diff Balls and E-Clips Over A Shag Rug*. In gym, use every opportunity to build your physical stamina for the rigors of R/C racing. You think standing up for four minutes is easy? Above all, remember that with research, there is hope. Good luck with your "problem!" —Pete



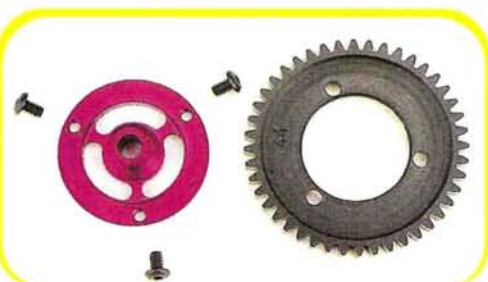
## ARM and HAMMER

I appreciate the beauty of Trinity's rebuildable stock motor concept, but I'm still too lazy to open up a Paradox or Chameleon and true the comm! Looks like Trinity has guys like me in mind: now they offer Paradox and Chameleon "Pro-" style blueprinted armatures. All "Pro" arms feature precision, diamond-trued comms for better brush contact and are balanced for smoother operation and the highest possible rpm. The Paradox "Pro" armatures are designed to ROAR and NORRCA specs and are legal for NORRCA competition. Just drop in a "Pro" arm, and hammer. Get it? I'm so damn clever, I amaze myself.

Trinity Products Inc., 36 Meridian Rd., Edison, NJ 08820; (732) 635-1600; fax (732) 635-1640; website: [www.teamtrinity.com](http://www.teamtrinity.com).



BY CHRIS CHIANELLI



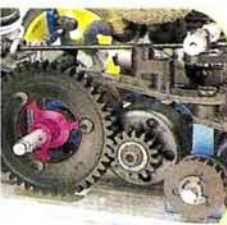
## Speedy gear swapper

HPI Nitro RS4 owners, rejoice! Robinson Racing Products' (RRP) spur-gear adapter for the popular vehicle allows much faster spur-gear changes;

just remove the belt and the Robinson spur is easily unbolted and slid over the pulley. The spur gears themselves are made of RRP's extra-tough black material and are machined for dead-on concentricity and correct tooth profile. The adapter

is machined from solid aluminum and holds the spur gear tightly with three button-head screws. The new part makes gear changes easier and adds a little color to your car as well. The adapter is currently offered with a 44T gear, and a 46T gear is also available.

Robinson Racing Products; 4968 Meadow View Dr., Mariposa, CA 95338; (209) 966-2465; fax (209) 966-5937.



## NEW TAMIYA TRUCKS!

Hey, everybody loves the Clod Buster and the Blackfoot series—and we've been loving them for a long, long, long time! The two all-new flatbed machines from Big T pictured here will undoubtedly ignite the already rabid passions of Tamiya fans specifically and truck buffs in general; check 'em out.

First up: the Juggernaut. I predict that Tamiya will not be able to keep this Clod Buster replacement in stock. All I've got to go on is the spy photo smuggled out of Germany by Group Editor-in-Chief Tom Atwood, but I can see an aluminum chassis with ladder-bar suspension, eight shocks (looks like they're friction units), a cool stamped brush guard and a Ford F-350 "hard" body complete with chrome detail pieces. Much too cool.

For the more cost-conscious trucker, the Wild Dagger will offer dual-motor, 4WD punch on a budget. A modified TL01/TL01B chassis provides the platform, and reconfigured gearboxes are designed specifically to accommodate the monster-size tires. A double-wishbone suspension handles the bumps, and the battery is mounted between the motors for a balanced chassis. The truck shell shown is included, and you can even use TL01 and TA03 bodies. Looks hot!





## MYSTERY SEDANS FROM NEO

So new they haven't even been named yet! NEO plans to release both electric tourers pictured here. No real info on 'em yet, but it looks as though both have fiberglass chassis, ball diffs, aluminum shocks, conventional hub/hub carrier/A-arm suspensions, direct-link "no-bellcrank" steering and built-in swaybars.

As I learn more, you'll learn more!

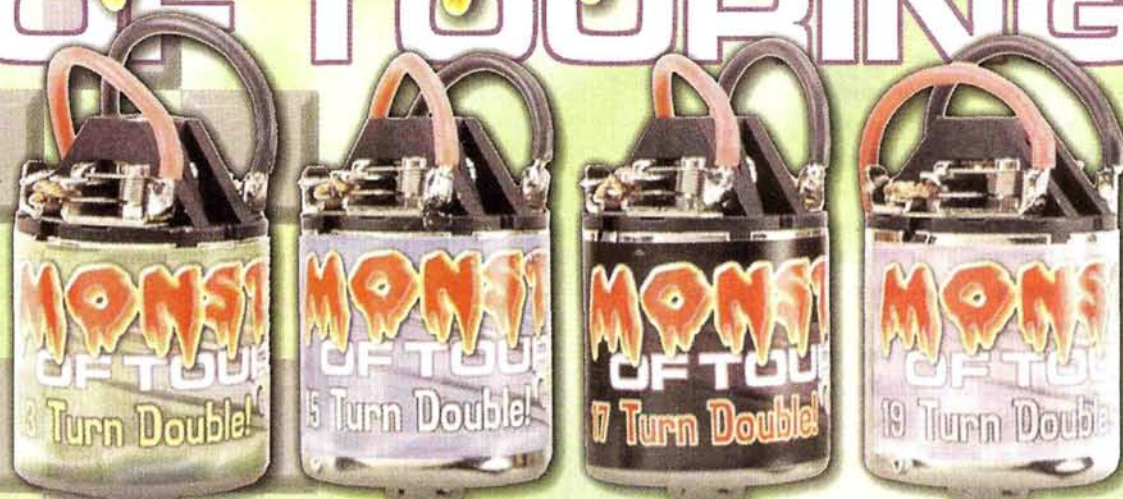
NEO; distributed by Golden Horizons; 311-938 Howe St., Vancouver, BC V6Z 1N9 Canada; (604) 207-2108; fax (604) 207-2109.

## EASY BODYWORK

If you're willing to spend enough time monkeying with trim lines and body posts, it's possible to make just about any body fit any vehicle, but life is a whole lot easier when the body is designed for your car. If that vehicle happens to be a Traxxas, you're in luck. Parma has just released this direct-fit shell for the Rustler as well as a new F-150 body for the Stampede complete with cab spoiler and visor (not shown). For use with just about any 1/10 chassis, Parma also offers this beautiful Ford F-350 extended cab—shown here on a Clod Buster. Lookin' good!

Parma/PSE, 13927 Progress Pky., North Royalton, OH 44133; (440) 237-8650; fax (440) 237-6333.

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## I'm rubber; you're glue



**T**eam Losi makes excellent racecars and excellent tires. Is it really a surprise that the Losi crew has also come up with an excellent glue?

The new Tread Lock sticky stuff is specially formulated just for tire mounting and has been fully tested by Team Losi. Now I can glue my thumbs to my tires with an even tighter bond!

Team Losi, 13848 Magnolia Ave., Chino, CA 91710; (909) 465-9400; fax (909) 590-1496; website: [www.teamlosi.com](http://www.teamlosi.com).

## YO!

... or yo-yo, as the case may be. Since I'm talkin'

Losi, I thought I'd show off

the Team Losi yo-yo line. As an R/C'er,

it's cool to have a Team Losi yo-yo to help pass time between heats. However, there's

more to these yo-yos than the "Hey, it's a Losi" novelty factor. Pro yo-yo players rank these little gems among the best in the world!

All Team Losi yo-yos are rebuildable, ball-bearing equipped and feature adjustable string gap. Da Bomb is renowned for its looping abilities, and the new Cherry Bomb is perfect for string tricks. The Grim Sleeper is my favorite, although I confess I stink at yo-yo playing.

Losi, 13848 Magnolia Ave., Chino, CA 91710; (909) 465-9400; fax (909) 590-1496; website: [www.teamlosi.com](http://www.teamlosi.com).



## Mo' flow

Corally, no stranger to high-performance R/C, has introduced a motor line featuring the company's all-new Dynamic Flow can design. Corally claims the design draws air in through the openings in the front of the can, forces it to take the longest route through the can to maximize cooling, then expels it through the rear exhaust ports. "C99" magnets and "Ultraflux" can material allow the can to be thinner and lighter without compromising its magnetic field, says Corally. A new endbell design with plenty of heat-sink area and built-in brush dampers completes the package. The Dynamic Flow can is offered separately, or built-up as Street Touring, Street Racer, Competition and Pro Series motors. Street motors are brushed; Competition and Pro motors are bearing-equipped.

Corally; distributed by Du-Mor R/C, 1002 Union Landing Rd., Cinnaminson, NJ 08077; (609) 829-1338; fax (609) 829-9303.



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## Formal wear for your 1/8-scale buggy?

Pro-Line's popular BowTie tread pattern comes to 1/8 scale! The new tires are offered in XTR and M2 compounds and include foam inserts. If you want to terrorize the local parking lot between race days, mount a set of Pro-Line's Road Rage treads on your big buggy. The on-road meats look killer! See for yourself.

Pro-Line/Jaco, P.O. Box 456, Beaumont, CA 92220; (909) 849-9781; fax (909) 849-2968.

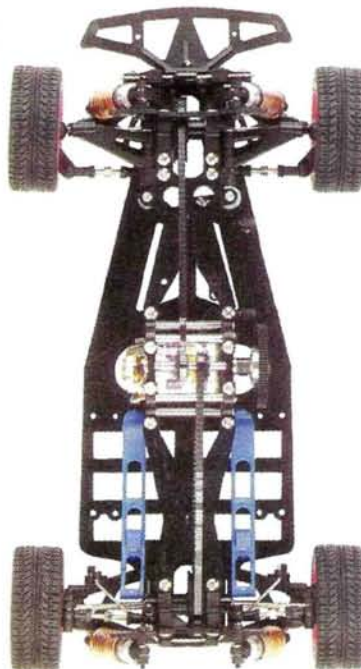


## An IPC for you and me



LRP has added some new models to its IPC digital line, best known for the popular V6 controller. The IPC Sport, pictured here, is the least expensive unit but is well equipped, nevertheless; LRP claims it will handle 14-turn mods, and its 1,250Hz operation should make for smooth control. A current limiter is included, and push-button setup is standard; gotta have that. Also available: IPC Super Sport and Pro Sport, the especially-for-stock-racers IPC-SR and the good ole IPC V6.

## ALL-NEW TOURING CAR FROM OFNA!



There have been rumors floating around of a new Z-10, but this is the real scoop: OFNA's OB-4 Mid Drive touring car. As you can see, the motor is mounted ahead of the batteries, much like the exotic, hideously expensive OVA Cocoon. Note the pivot-ball suspension as well—not to mention the aluminum shocks, front and rear swaybars, "CVA" universal shafts and quick-release saddle-pack hold-downs. OFNA plans to follow up the 190mm electric kit with a 200mm nitro version and even a 230mm "Super Nitro" OB-4. This car looks like a real contender—and that's no Jedi mind trick.

OFNA Racing, 22600 Lambert, Ste. D-1009, Lake Forest, CA 92630; (714) 586-2910; fax (714) 586-8812.

## CRC Carpet Knife

The Carpet Knife and the Six Pack are the newest 1/12 cars to come from the Calandra Racing Concepts stables.

The purpose-built, 4-cell, Carpet Knife features sideways battery slots for ideal weight distribution and a unique rear pod design that features pivot balls instead of the traditional T-plate. According to CRC, this design is better suited to 4-cell racing.

The more conventional Six Pack design accommodates 4- to 6-cell saddle packs. It includes a T-bar rear suspension that provides the maximum rear traction that is required for the more powerful 6-cell battery packs. However, the T-plate isn't used for side-to-side stiffness; instead, small side springs are used for more consistent action. The Six Pack is also completely compatible with Team Associated's 12LC/L3.

Both cars feature:

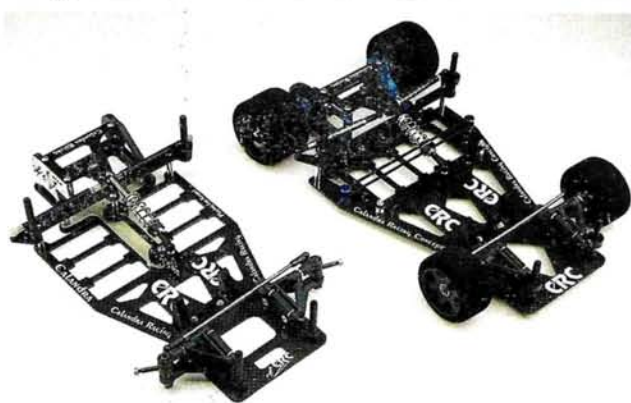
- D-shaped diff rings that are indexed to the hubs. These rings are cut to the same dimensions as those used in Team Losi kits.
- Dual aluminum side dampers and Associated VCS Micro shock.
- Universal servo mounts that can accommodate most popular-size servos.
- Double machined, low-profile battery slots that don't require filing. The batteries are already flush with the bottom of the chassis for the lowest CG possible. Sweet!

The CRC Carpet Knife finished first in the A-main of the Masters' class, and the Six Pack took top honors in Stock at the 1998 Cleveland U.S. Indoor Championship, so they're definitely potent performers.

List price: \$249.95 each.

CRC, 6860 Stanwix Ave., Rome, NY 13440; (315) 338-0867; website <http://www.teamcrc.com>.

## and Six Pack 1/12 cars





# DURATRAX

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Send a sharp, uncluttered, well-exposed color photo of your car or truck (no Polaroids, please!), along with a brief description, to Readers' Rides, *R/C Car Action*, 100 East Ridge, Ridgefield, CT 06877-4606. If we choose to feature your creation, you'll receive a 6-month subscription to *R/C Car Action*, or an extension of your existing subscription. You'll also be eligible to win a \$500 gift certificate from DuraTrax in the ninth annual "Readers' Rides of the Year Contest" in the fall of 1999. In case we need to contact you, write your address and phone number on your letter and on the back of every photo you send. Good luck!



### California Cruisin'

Twelve-year-old Brian Raff of Ridgecrest, CA, sent us this photo of his OFNA Z10 Stock. The car has all stock parts, plus slick tires and full ball bearings. A Trinity Midnight 2 Pro Stock motor sits under the hood, along with a Novak Explorer Sport speed control. He also uses an Airtronics Rival Sport radio and an Airtronics servo.

### Custom Creation

George Weyrauch Jr. of Elkhorn, WI, is proud of his RC10 T2-T3-GT, which he customized using his tool-and-die and mold-making skills. The entire front end is from a T3, with custom-machined aluminum front hub carriers for strength. Some examples of his personal touches on the chassis include turning the fuel tank 180 degrees (for easier pit stops), machining an aluminum tranny brace with holes drilled for weight reduction, and attaching the rear camber linkage with shock ends for a little more strength. The truck also features shiny CVDs, an Associated graphite shock tower and aluminum brake adapter, an O.S. Max CV motor with C2-2 head, titanium tie rods, blue screws and Pro-Line high velocity rims—all topped off with a Ford F-150 body.



### Virtually Vintage Ride

This Tamiya Wild Willy was bought nearly 20 years ago by Darren Choy of Oakland, CA. The stock car has its original 540RS motor, a mechanical speed control and 7-cell hump pack and is controlled by a Futaba Magnum radio. Darren recently restored the car, repairing damage caused by several rollovers on the pavement. He had to build a new front grill from scratch using sheet styrene. Darren says this car does endless wheelies. No wonder the driver missed the photo-op; he was still "in recovery"!

### Long Wheels of the Law

Harrison Ortis of Upland, CA, says he recently purchased this Kyosho PureTen GP Spider Mk 2. He has added an O.S. .12 CV-X with an O'Donnell head, a Ron Paris Turbo Ring pipe, a stainless disk rotor, a center- and side-belt tensioner, a urethane foam bumper, a 2-speed racing transmission and a 4mm Super Chassis. The car also features Dynamite Red Seal ball bearings and an MIP onboard temp gauge, topped off by a Mercedes CLK-GTR body. Harrison added working headlights, siren and flashers for realism. This is one serious vehicle.



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## Ready to Race

Colin Goddard of Norcross, GA, says he races this HPI Nitro RS4 at Atlanta's Dixie Racing Club. Powered by an O.S. .12 CV with O'Donnell head, Paris Turbo Ring pipe and an HPI header, the car features an Allen chassis, MIP CVDs, HPI and RPM wheels, Eagle Belted Slicks with Kawada foams, Boca bearings and HPI 2-speed gears. The car is topped off with a Dahm's lightweight body and is controlled by an Airtronics CL3SP.

## New York Driver

This ride was built by Ray Pender of Watertown, NY. This North Eastern D.I.R.T. Modified has a chassis designed by Ray. It sports Associated RC-10 shocks, a Stealth transmission and a Novak Tempest speed control. Ray says he enjoys racing in Syracuse and on other upstate New York tracks. With wheels like these, we're sure he does.



## Buggy Power

Mike Dunbar of Piscataway, NJ, says he likes to race his Losi Double-X 'CR' against his brother-in-law's similar buggy. Mike's vehicle features a Trinity Speed Gems 2 Ruby motor with a Tekin Rebel ESC and Futaba radio gear. He added the following: MIP gold shock shafts and CVDs and Lunsford titanium hinge pins and turnbuckles. He made the flames by cutting them out of paper and masking them, then painting them with canned paint—no airbrush!

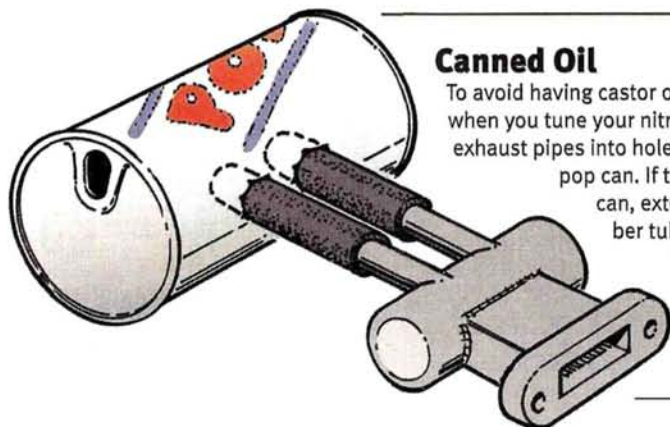


## Black Beauties

Marco Mourik of Holland sent us this photo of his two mini Mercedes. The one in the rear is a Tamiya Mo2L that features an Acto M-special motor, a Tamiya 1400SCR Gold pack, full ball bearings, a swaybar set, aluminum shocks, an aluminum heat sink, HPI mesh wheels, Pro-Line V-Rage tires and an RPM Fat Boy exhaust pipe. Futaba's Attack radio and MC116B speed control direct its moves. Up front is an HPI mini Mercedes A-class. It's equipped with a Kyosho 14x2 motor, a Panasonic 1700SCR battery pack, full ball bearings, Pro-Line Warlock wheels with super low-profile Schumacher tires and a Slim Twinz RPM exhaust pipe—all controlled by a Futaba Attack radio and an M.Troniks Digital Sprint speed control. Stylish!



Radio Control Car Action will give a one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Pit Tips." Send a rough sketch to Jim Newman, c/o Radio Control Car Action, 100 East Ridge, Ridgefield, CT 06877-4606. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. We're unable to publish many good tips because we don't have the sender's name and address. Please note: because of the number of ideas we receive, we can neither acknowledge every one, nor can we return unused material.



## Canned Oil

To avoid having castor oil stain your driveway when you tune your nitro engine, insert the exhaust pipes into holes punched in a soda-pop can. If there is no room for the can, extend the pipes with rubber tubing, as shown here.

The oil catcher will act as a muffler, too.

CHAD MARTIN  
Athens, PA



## In the Tub

Save those 8-ounce plastic butter tubs! They are stackable and good for keeping motors and other parts organized and out of the inevitable dust in your shop. Use spare computer labels to record the tubs' contents.

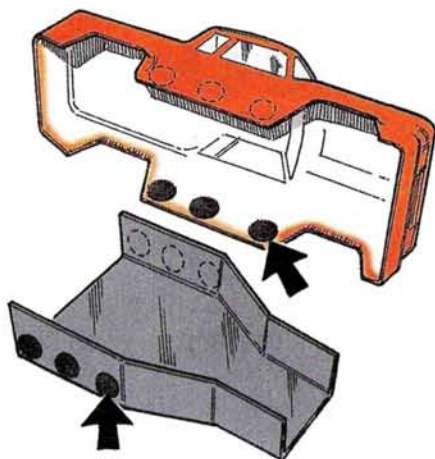
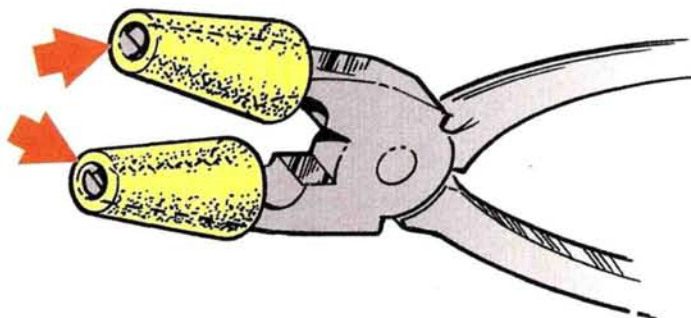
DENNIS LANGE  
Browns Mills, NJ

## Soft Jaws

Pliers jaws can seriously damage precision items such as shock shafts.

To avoid scarring the shafts, force fuel tubing onto the pliers' jaws to protect those polished surfaces.

CLINT CARNEY  
Spokane, WA



## Stick a Body

Instead of using body clips and mounting posts, glue dots made of Velcro®-brand fastener to the sides of the chassis and inside the body shell. This is a neat and fast way to mount the body shell—no holes to drill or clips to lose.

TOM SYMONS  
Milford, MI



## Punch Drunk

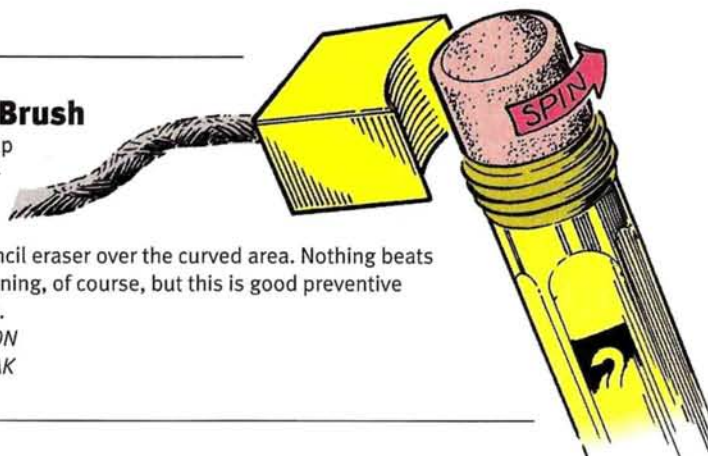
Stripped screw heads can sometimes be slotted with a rotary tool for easier removal, but that technique can also damage surrounding parts. To avoid damaging the surrounding area, try using a nail-set to turn the screw with a few well-placed taps.

JOHN GEORGOPOULOS  
Hanover Park, IL

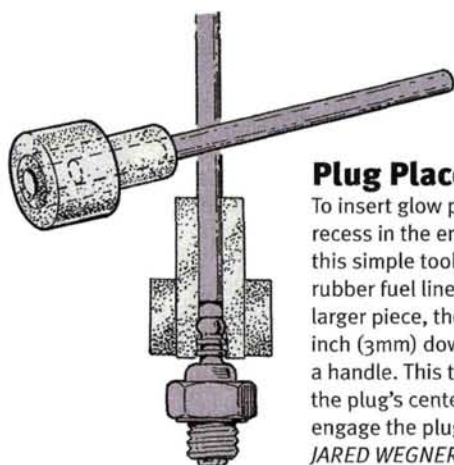
## A Clean Brush

To brighten up motor brushes between runs, try twirling a pencil eraser over the curved area. Nothing beats a proper cleaning, of course, but this is good preventive maintenance.

MARK BRETON  
Anchorage, AK







## Plug Placer

To insert glow plugs into that deep recess in the engine head, make this simple tool. Force a piece of rubber fuel line inside a slightly larger piece, then insert an  $\frac{1}{8}$ -inch (3mm) dowel into the end as a handle. This tool will firmly grip the plug's center post when you engage the plug in the thread.

JARED WEGNER

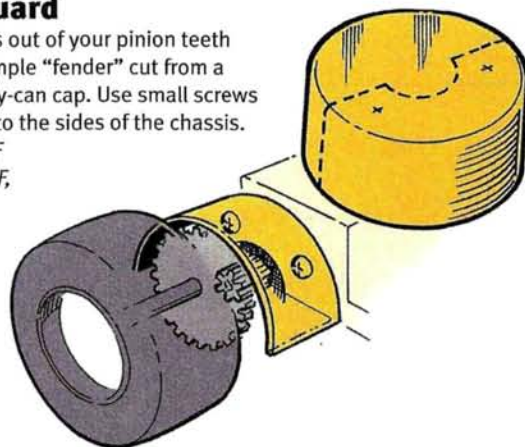
Edmonton, AB, Canada

## Rock Guard

Keep stones out of your pinion teeth with this simple "fender" cut from a plastic spray-can cap. Use small screws to attach it to the sides of the chassis.

PAUL BRUFF

St. Johns, NF,  
Canada

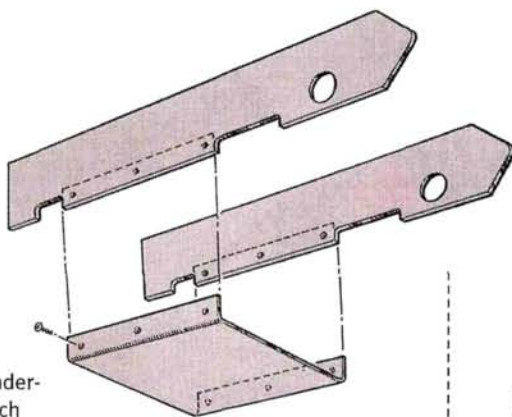
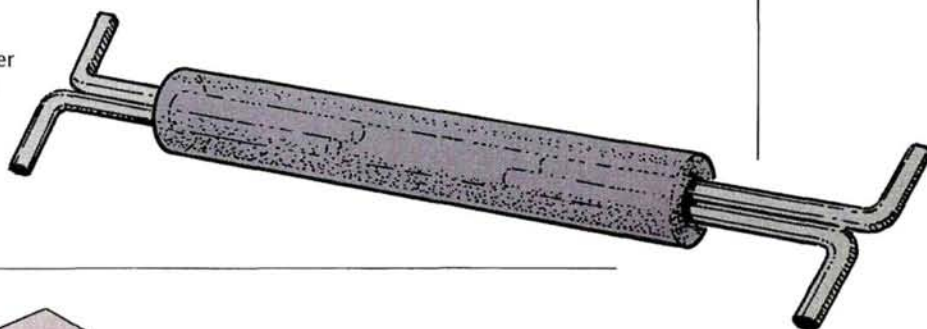


## Tool Tube

Insert your Allen wrenches into a piece of rubber tubing. This simple caddy keeps your hex keys at hand rather than mixed up in your shirt pocket. Color-code your keys and screws, too, for instant recognition.

ROBERT LAWS

Anchorage, AK



## Stiffer Digger

Assemble an under-tray from  $\frac{1}{16}$ -inch (1.5mm) aluminum, then attach it to the chassis using at least three 4-40 screws, nuts and locking washers per side. This will stiffen the chassis and will also protect the electronics that are mounted between the chassis sides.

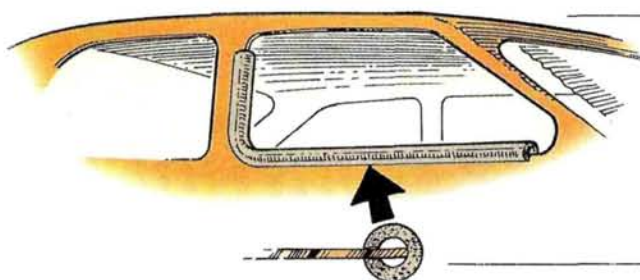
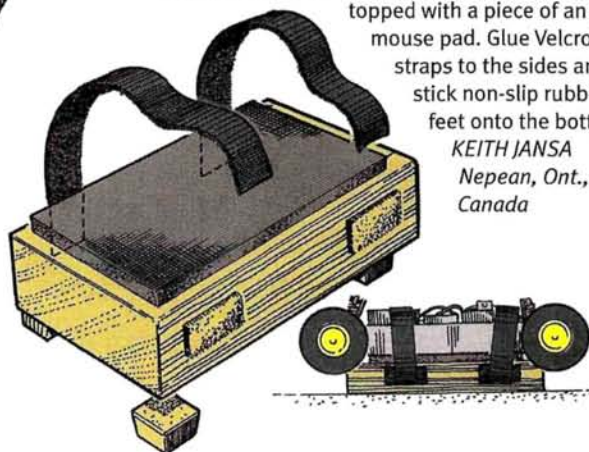
TOM BELMONTE

Tewkesbury, MA

## Strap it Down

This truly inexpensive car stand is easy to make. The wooden block measures 2x6x8 inches and is topped with a piece of an old mouse pad. Glue Velcro® straps to the sides and stick non-slip rubber feet onto the bottom.

KEITH JANS  
Nepean, Ont.,  
Canada



## Gas-Car Body Protector

Split a piece of fuel line or wire insulation, then glue it to the edge of the window opening. This will prevent the engine's starter cord from tearing up the body shell.

CHRISTIAN BROWN

Ventura, CA





**ROBINSON RACING PRODUCTS**

**TROUBLESHOOTING**

BY DOUG MERTES • ILLUSTRATIONS BY JIM NEWMAN

## Timing is Everything

I'm 14 years old and I would like to know how to alter the timing on an electric motor. How do you do this if it doesn't have an ignition like on a full-size car? On the back cover of the October issue of *R/C Car Action*, there's a picture of a Trinity D3 .5, and it shows timing marks. What do they mean? **KERRY DAVID, Lake Havasu City, AZ**

When the brushes are centered directly over the magnets in the can, the motor is said to have zero degrees of timing; most modified-motor cans have a mark that matches a mark on the endbell to help you find zero timing. If you loosen the endbell screws and hold the motor with the endbell facing you, you can move the endbell; from the zero point, move it clockwise to retard the timing—not a good idea—or counterclockwise to advance the timing. Advanced timing will increase rpm (to a point) but will mean shorter run time, smaller pinion gears and more heat. Though motor builders and tuners seldom agree on the “correct” timing for a given motor, I've found that with most mod motors, somewhere between 18 and 22 degrees of advanced timing yields the best overall performance. Since many mod motors come with a set of timing marks printed on the label, it's often easy to determine just how much advance has been cranked into them.



# Extreme Results From RRP.

**Richard Saxton Chooses Precision Components From Robinson!**

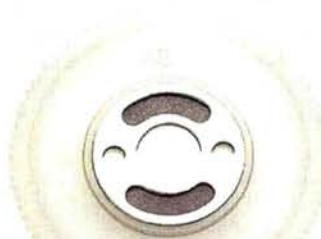


**1998 World Cup and National Champion Richard Saxton:**  
“I only care about performance, and that's why I run Robinson Racing gears and slipper clutches exclusively.”

— Richard Saxton



**Absolute Series Pinions:**  
Available in 48P in 16T thru 28T sizes. Super hard, lightened and cut unmatched precision. Great with any spur, but with an Absolute spur, even on-off noise is gone! RRP 1416 - RRP 1428.



**Absolute Series Spurs:** Available in 48P in 80T thru 91T, this is the quietest spur you can buy! RRP 1780 - RRP 1791.



**RC10 GT Clutch Bells:**  
Precision machined one-at-a-time from a single piece of steel and then hardened. Fits ALL Associated and MIP shoes. (New 14T) RRP 2214 - RRP 2224.



**RC10 GT Gas Spurs:** Super tough and precision machined from heat-resistant plastic mesh flawlessly with our Clutch Bells. 32P in 61T thru 67T. RRP 2261 - RRP 2267.



**Associated Blue Lightened Slipper Kit:**

The rear plate is hard anodized to reduce wear and the front plate is color treated. The front plate is designed to hold the slipper pad forcing the pad to slip on the rear plate. When pad shows sign of wear just flip it over for a new surface. Metal parts are CNC machined for a flawless fit. RRP 1515.



**Titanium Stealth Top Shaft:** CNC Machined from a single piece of titanium, this super hard, super light top shaft will fit any Stealth transmission. No serious racer should do without this part. RRP 1512.

**“Turn to Robinson Racing when compromise is out of the question.”**

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## Mechanical Mayhem

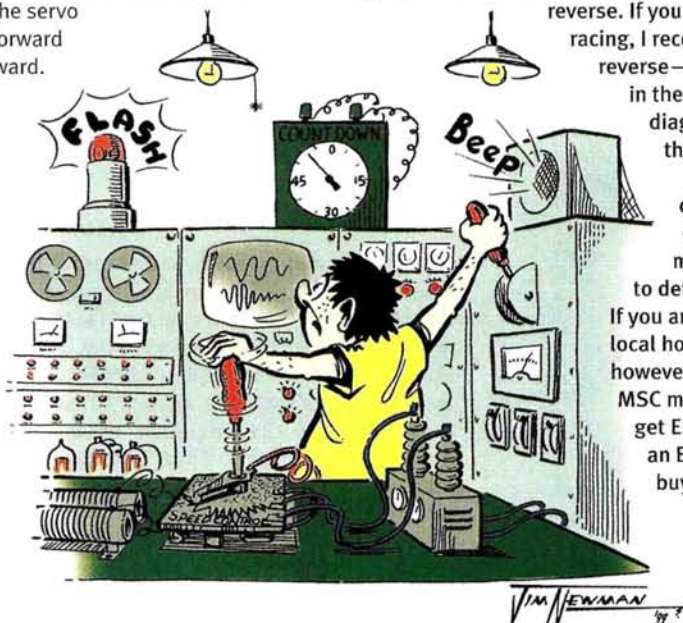
About two months ago, I bought a Kyosho Tracker 2WD electric truck, and it ran pretty well until a few days ago. When I was taking it off a small jump, the red wire to the motor came off, so I soldered it back on. When I took the truck out again, it stopped running. The servo that turns the speed control was stuck in the forward position like it is when the truck is moving forward. Then the battery started smoking, some of the plastic case melted, and the resistor turned black! Can you please tell me what is wrong with it and what I should do?

RICHARD CALDER, Havre de Grace, MD

Mechanical speed controls (MSCs) are really a series of switches mounted on a small, flat plate. As the wiper moves across the switches at lower speeds, some of the battery's voltage is sent to the resistor, where it's wasted as heat. Compared with electronic speed controls (ESCs), MSCs have three disadvantages: the switch contacts wear out and become unreliable; they waste battery power in the form of heat; and they tend to be bulky and cumbersome. Though an MSC can last years,

it requires substantially more maintenance than an ESC, so my first hop-up recommendation is an inexpensive, reliable, budget-level ESC. Racing-style ESCs are forward-only, and others have forward and reverse. If you don't plan to enter organized racing, I recommend a speed control with reverse—much more fun! If that's just not in the cards, you'll have to do some diagnostic work on the controller that you have.

Your problem is the result of a dead-short somewhere in the electrical system. Look at the motor, battery and speed control to determine whether there is a short. If you aren't sure how to do this, ask your local hobby shop for help. Keep in mind, however, that the cost of replacing the MSC may be close to the cost of a budget ESC. If you could possibly afford an ESC, I highly recommend that you buy one.



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**RS4 Nitro Gear Adapter & Super Tough 44T Spur:** Precision CNC machined, this adapter reduces out-of-roundness and wobble. The spur is cut from a heat resistant plastic. Fits all HPI Nitros. RRP 1535.



**HPI Titanium RS4 And Pro Tie Rods:** Super strong, super light. 4mm RRP 1526. 3mm RRP 1525.



**HPI Titanium Shock Balls:** They're super strong and super light. The RRP 1524 are for shocks, and the RRP 1522 (short) and RRP 1523 (long) are for everywhere else.



**HPI SuperLite™ Purple Aluminum Sedan Pinions:** They're lightened, hard coated and precision cut. Available in 48P in 16T thru 28T, and 64P in 24T thru 38T. RRP 30XX (48P) and RRP 31XX (64P). **Only \$5.25.**



**Sure-Fit™ Adjustable Ball Cups:** Unique 8-point design minimizes contact and reduces friction. Set screw adjusts away slop. Shanks have been "beefed-up". Fits all HPI cars and trucks. RRP 2013.



**HPI RS4 And Pro Gear Adapter:** Puts spur closer to the last supporting bearing on top drive shaft. RRP 1519. Purple anodized.

**HPI Stealth Sedan Spurs:** These are high precision machined spur gears. The lightening holes reduce the rotating mass of the gear, boosting performance. They're available in 48P in 60T thru 96T sizes, and they'll fit any HPI electric car or truck. RRP 1860 - RRP 1896.

**"For over 12 years, Robinson Racing has made the highest performing gears and accessories available for RC racing. The tradition continues!"**







# RRP

## ROBINSON RACING PRODUCTS

### TROUBLESHOOTING

#### Don't have a Seizure!

I went to my local hobby shop for an engine diagnosis, and they told me my engine had frozen, or "seized." They say the piston is stuck to the cylinder and the engine will not work. How do you think this happened, and can it be fixed? Or should I get a new engine? Please help!

ADAM MILLER, San Dimas, CA

A combination of excess heat and insufficient lubrication will cause an engine to seize. Unlike the 4-stroke engines in automobiles, our 2-strokes don't have any oil in the crankcase; instead, the lubricant is mixed with the fuel. The amount of fuel that goes into the engine is critical because it also determines how much lubricant is supplied. Having the proper air/fuel mixture is obviously very important: have too much fuel and the engine runs poorly because there is more fuel than it can burn—referred to as a "rich" mixture. At the same time, the engine is also being given too much lubricant, and that can foul the glow plug—a condition that can be annoying but it only causes the engine to run poorly. That isn't what's causing your problem.

Your problem is the result of running the engine with a "lean" mixture—too little fuel and lubricant. When an engine is starved of fuel, it's also starved of lubricant, and this causes excessive heat that

eventually melts the piston and causes it to stick to the sleeve. The cruel irony is that the engine usually runs at its best right before something like this happens. The fuel mixture is so lean that all the fuel is burned. This is great for maximum horsepower, but you're right on the ragged edge of disaster, as there is barely enough lubricant to protect the engine. At this point, a 5-degree change in running temperature can spell disaster. The moral of the story? Be suspicious when your engine starts to run too well.

Fortunately, there's a fairly easy remedy for your problem. You will certainly need a new piston and sleeve, and you might need a new connecting rod. When an engine stops violently, the connecting rod can stretch; you may even have to cut the connecting rod to remove the damaged piston and sleeve. Without using too much force, first try to separate the piston and sleeve. To free the piston, *lightly* tap the top of it (I emphasize "lightly"—no full swings, please) with a wooden dowel and a small hammer. If you're successful, you may be able to salvage the rod; check it to see whether it wobbles on the crankpin; if it does, it's time for a new one.

Simply replace the piston and sleeve—and possibly the connecting rod—and your engine will be as good as new!

#### Battery-Bustin' Charger

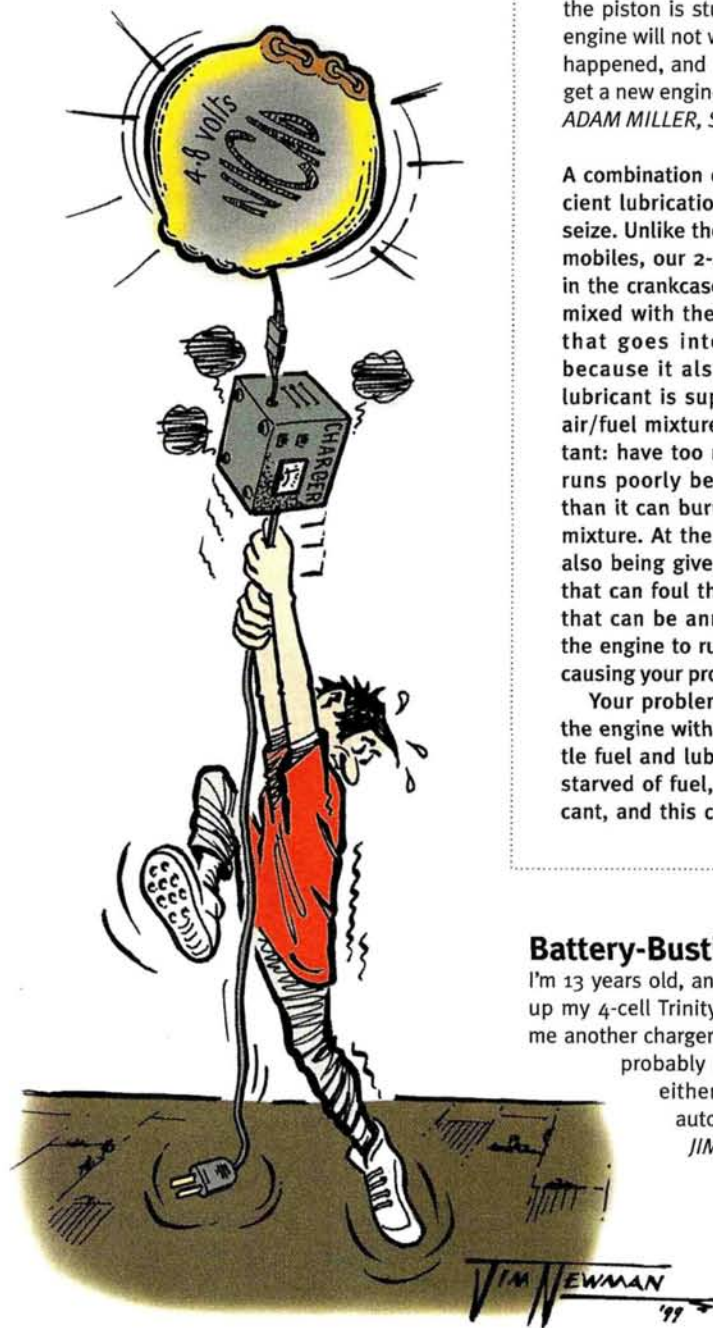
I'm 13 years old, and I recently bought a peak-charger from my local hobby store. After it blew up my 4-cell Trinity Ex-Spec battery, I returned the charger to the store. The manager gave me another charger and battery, and after contacting his supplier, he said the first charger was probably defective. Unfortunately, the new charger doesn't seem to work properly either. I have to time the charge with a stopwatch because it won't shut off automatically. Can I do anything to make my charger work properly?

JIM BROWN, Belmont, NH

It sounds as if you're trying to run in a Legends class up there in New Hampshire, Jim, and I bet it would be a lot of fun if you could just get that darn battery charged! Unfortunately, some chargers can't peak-charge a 4-cell pack properly. Ten years or so ago, even high-quality DC peak-chargers had an additional resistor (wired in series with the battery pack) that allowed them to charge 4-cell packs. Before you buy

any charger, be sure it can charge 4 cells. Many of the less expensive peak-detection chargers are limited to charging 6- or 7-cell battery packs.

Read the literature that came with your charger to see whether it's capable of charging 4 cells; I bet it isn't. In any case, your hobby shop should work with you to get your charging problems sorted out. Look for a charger that will charge 4 to 8 cells, and I think you'll be in much better shape.





## The last detail— a tricker sticker

Today's R/C body and decal sets can make short work of producing a sharp-looking shell. In many cases, a simple one- or two-color paint job can become a concours winner when paired with the proper decals. Poorly applied decals, however, will make even the finest paint job look like a rushed effort. This month, I'll help you avoid the headaches and pitfalls of decal application as I tackle a Tamiya\* Mitsubishi Lancer body set.



**Tamiya's highly detailed bodies and high quality decal kits make them second to none in the world of R/C! In a short time, with some patience and a little extra effort, your tourer could look as good as the magazine ad!**

### TRIMMING TIPS

Large graphics and a multitude of smaller stickers make the Lancer body set (no. 50757) the perfect choice for this "Concours Corner" session. As always, the decal sheets include full-color graphics on high-quality vinyl. Those decals won't look very good if they're trimmed sloppily, so here are some tips:

- Trim the decals as closely as possible to the colored area to make the graphics look more authentic and make application easier. A good pair of scissors or a sharp hobby knife works best.
- If you don't have a steady hand and a sharp eye, use a straightedge to achieve smooth, clean cuts when cutting lines of type or other straight-edged graphics.
- If you look closely at a Tamiya decal sheet, you'll notice small alignment marks that make placement of the decals easier. These marks are usually printed in the color suggested for the body, and this makes them invisible when the decal has been applied.
- After you have cut out the graphics, pick up the decal with the tip of your hobby knife.

This is a good way to transfer it to the body without touching it with your fingers. If you must touch the decal, try to do so only at its edges; avoid touching its adhesive backing.



**Above:** total accuracy right down to the hood pins and radiator assembly; the decal sheets are packed with almost as many graphics as there are parts to the chassis. Close, precise trimming pays off up front where recessed body parts require a tight fit.

**Right:** on sharp body contours, it sometimes helps to cut the decal into sections. Small "relief" cuts can be made with a hobby knife to smooth out those troublesome wrinkles. Trim tape can be used to clean up the rough edges around the taillights. To complete the rear view, RPM's\* Slim Twinz chrome pipes (no. 8122) were installed for added realism.



**To get the larger graphics properly placed, use the door handle and the window opening as alignment guides. Once the decal has been aligned, apply pressure to its edge to**

**make it stick. Start at the top of the door and work downward, making sure that the decal conforms smoothly to the body contours and checking that**

**there are no air bubbles. A blast from a hair dryer set on "high" will help the stretchy vinyl hug those tricky surfaces. Apply window-trim pieces last; they will cover any exposed edges and give a finished look.**





## SLICKER STICKER

- Before laying down any graphics, make sure that the surface of the body is clean and free of dust and paint overspray.
- Spray the area with Autographics\* "Sticker-On." Give the decal a quick shot, too. The application fluid allows you time to slide the graphics around into the correct positions before the adhesive takes effect, and it's a great help when applying large graphics.

- Once the sticker is in place, work from edge to edge to squeeze out excess fluid and air bubbles with a clean paper towel. With larger graphics, it may be easier to work from the center out to the edges.
- Despite the decals' flexibility, you might still have wrinkles or creases. A blast of hot air from a hair dryer set on "high" will make the decal more pliable and allow you to smooth out the problem area with your finger.

- If a wrinkle persists, make a small "relief" cut through it so that it can lie flat.
- If air is trapped beneath the decal, pierce it with a hobby knife and then smooth it down.
- Add window trim last to cover any rough edges.
- Be sure to give the body time to dry completely, then go over all the graphics with a clean, damp paper towel to wipe off fingerprints and burnish down all their edges.

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Here are some tips for easy custom-lettering application. Once you've cut out the letters or graphics, "weed" the artwork; this is sign-shop talk for the removal of the excess vinyl that surrounds the letters and also for the centers of any "enclosed" letters such as "d," "e," "o," "p," etc.



Tight body seams may cause a decal to "bridge" instead of lying down nicely. Use a cotton swab to burnish down the decal in tight spots and squeeze out any excess fluid. If this is still a problem area, make an inconspicuous cut on the decal along the body crease. When the decal lies flat, the cut will be almost invisible.

## FINAL LINES

Tamiya bodies are works of art; if I could find a way to frame them, I'd hang my favorite examples on the wall! I often spend considerably more time detailing the body than I do building the car itself, so I always save one shell for concours display and have another race ready. After my race day, I like to place the model in a location where I can easily view and admire my work. When the body isn't in the display mode, I store it safely in a plastic bag to keep it looking fresh and dust free. Until next time, enjoy your R/C hobby! Fun; that's what it's all about!

\*Addresses are listed alphabetically in the Index of Manufacturers on page 209.



## Battery Maintenance Tips

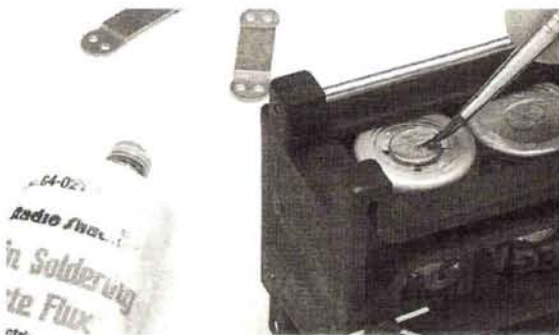
**W**hat's the single most expensive R/C component you own? Is it the high-zoot car or truck that represents the state of the art in suspension design? How about the brand-new FM radio with enough knobs and buttons to make NASA green with envy? Nope; if you're into racing, even if only half seriously, chances are you have more money invested in batteries—that's right: *batteries*—than in any other category of R/C equipment. Not only is the battery pack the heaviest item on your car

### Keepin' em zippy

or truck, but it also weighs most heavily on your wallet. It's not unusual for battery packs to cost more than motors, and you

probably have more packs than powerplants. Since you spend so much money on those lovely little Ni-Cds, doesn't it make sense to follow a simple regimen that will keep them at the height of their powers for as long as possible?

Regular readers of this column know how I hate to spend money, especially on things that can be maintained to prolong their usable life. On the other hand, I'm also a frequent and competitive racer (hey; I didn't say "competent"! ). At least once a week, you'll find me out on the dirt, the tarmac, or the carpet, banging wheels with a crowd of folks who all want to get to the next turn before I do. But because I love to race, you may be surprised to hear that I still run batteries that I bought five or more years ago! These may not be my very best packs, but even the newest cells I race with are over two years old. Even after a 100 cycles or more, these batteries still put out good voltage and very decent run times; in fact, I won the highly competitive Formula 1 class at the Maryland TCS race last summer using—get ready for a big surprise—Sanyo 1400 SCR cells that I bought in 1989! How can you make your battery packs last for years? Let's take a look at half a dozen proven ways that I use to maximize the life of my sub-Cs.



### SOLDERING CELLS

When I get a new package of cells, I put them together very carefully, and I always use high-quality tools and supplies. If put together properly, new packs give their best performance once they've been cycled two or three times. Since almost all of my battery packs are built in a side-by-side configuration, I can use premium battery bars for ultimate conductivity and still install the finished pack in most of my cars and trucks.

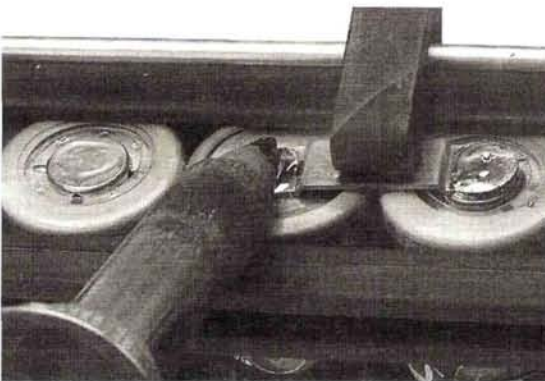
The thin battery ribbon used to assemble stick packs definitely has an

impact on the pack's ability to produce good voltage numbers.

Unfortunately, it's what you'll have to use if you're going to make a stick pack for a vehicle that can only accept that configuration. I've found, however, that run time from a stick pack made with high-quality cells is every bit as good as a saddle pack's run time. Critical to good battery-pack assembly are a high-quality soldering iron, rosin flux, sandpaper and individual-cell shrink-wrap.

I shrink-wrap all cells to protect the original labels; this also allows me to take

the packs apart every couple of years for rematching without damaging the original shrink. This stuff is sold by the yard at many hobby shops, or you can buy it precut. Just slip it on, center it on the cell, and use a hair dryer set on high to quickly shrink it down. Use sandpaper to remove some of the shine from the ends of the cells, or the solder will pool and slide right off. Before tinning the cell ends, I put a small



**Use a high-output soldering iron when assembling battery packs. Do the job quickly to avoid overheating the cell.**



**Don't leave your battery in the sun, and don't put it on ice or in the fridge! A fan will bring it back to ambient temperature in less than an hour.**

drop of rosin flux (available from RadioShack) on them; this helps the solder flow and adhere to the battery. Then I put the cells in a battery assembly jig to hold them in the proper positions, and I solder the bars in turn using a high-wattage iron (the Ungar\* UTC200 and 300 work well for this).

If you try to assemble cells using an iron that doesn't have enough wattage, you'll just heat and damage them, and that will lead to decreased performance. And you'll have a "cold" solder joint if you leave the iron on the solder too long; you'll recognize it because it will look dull—not bright and shiny like a good joint. A cold joint doesn't conduct power well and is more likely to break if stressed, e.g., during a crash.

I recently heard that some racers swear that the best connection between the battery and the bar results from the bar's being pressed against the cell end, not attached to it with solder. These folks lightly polish the ends of their cells with a wire brush on a rotary grinder, they hold the battery bar against the cell end very tightly using a screwdriver and then solder only around the edges—just enough to hold the bar in place. I've never tried this, but I do respect those who told me about this technique. The next time I buy new cells, I'll give this one a try and let you know how it works out.

### CHARGING METHODS

Ask 10 racers how they charge their batteries, and you'll get at least 15 different answers! That's because people try many methods. Then they read about other ways to put power into their cells, and they adapt what they've already tried to one of these new ideas, and ... well ... it gets pretty confusing very quickly.

In general, the most important thing I can tell you about battery maintenance is be *consistent*. Batteries like to be charged and discharged at pretty much the same rate



all the time, so pick one technique and stick with it. Well-known battery matchers don't agree on an optimum charge rate, but the ones I talked to all gave me suggestions that fell within the 3.5- to 5-amp range.

Generally speaking, using a higher charge rate will reduce run time slightly but will increase the pack's voltage output, especially during the first minute or so of a race. Lower charge rates tend to extend run times slightly but at the expense of some voltage output. So if you run in the stock class and you'd like to make sure that you get the maximum punch out of your cells, charge at 5 amps, let the cells cool for 15 minutes or so, and then re-peak them just before you go out to race.

"Modified" guys generally need all the run time they can find, so they should probably charge at a lower rate than stock-class racers. Using a lower charge rate could mean the difference between dumping just before the checkered flag and making that final lap under power. How about pulse rates, burp charges, flex methods, slow versus quick starts, etc.? All I can say is that I've tried 'em and they all seem to charge my packs about

## LET 'EM COOL DOWN SLOWLY

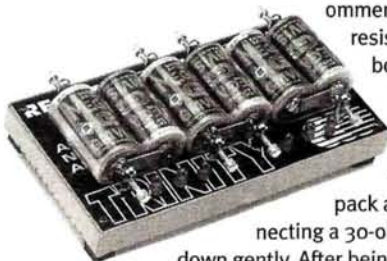
Cooling is one area in which people seem to get really ... creative. I've had people tell me that they stick their packs in the fridge to cool them down between runs; I've seen guys seal their hot, freshly discharged packs in a plastic bag and shove them into a cooler full of ice water to cool them down quickly. Folks, all I can say is that if you have money to burn, go ahead and do that, but if you'd like to use those packs for an extended time, avoid putting them through such radical temperature changes.

When a pack comes off the discharger, it tends to be pretty warm; sometimes, it's too hot to hold in your hand. Believe me, chances are, if it's warm on the outside, it's stinkin' hot on the inside! The interior of a Ni-Cd is gel, carbon and metal, all three of which have different expansion rates. Get a Ni-Cd really hot and then subject it to an extreme temperature change, and you'll wind up causing all sorts of Ni-Cd mayhem. Don't do it! Instead, cool the cells to ambient temperature using a small fan; this may take a hour or so, but it's well worth it.

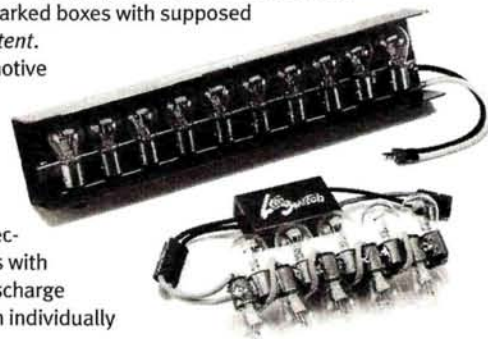
If you think we all have our own ways of charging packs, just ask about discharging techniques. People swear by (or at) everything from plug-in discharge devices to mysterious unmarked boxes with supposed magical properties. Again, like charging, you should strive to be *consistent*.

My post-race discharge process begins with a dozen no. 1157 automotive light bulbs that pull most of the amperage from the cells. Disconnect the bulbs when the lights start to go really dim, or use one of the excellent cutoff switches made by Deans\* or MPH\* to avoid the cell reversal that's caused by over-discharging.

After an hour or so, when the pack has cooled to ambient temperature, I put it on a Trinity discharge tray (I recommend either one of the older ones with resistors, or the new Real Time discharge board) and bring each cell down individually to minimum voltage.



If your cells are set up in stick packs, it's important to be extra careful when discharging them because the shrink-wrap and endcaps tend to hold a lot of heat in the pack. I use a string of six bulbs to discharge a stick pack and give it plenty of time to cool down afterward. I complete the process by connecting a 30-ohm resistor to the pack and leaving it plugged in overnight. This brings the pack down gently. After being discharged, the packs go into a safe storage container for a week's rest.



the same, so if you have one you like, stick with it. Switching to another charging method will not magically transform your cells into killers, but consistently using the same charging techniques will keep the good cells strong.

## HOW OFTEN SHOULD PACKS BE RUN?

One of the secrets to a long battery life is to run packs only once a week. Yes, I know that many folks swear that you can charge the same pack several times a day, and you can, but I don't think that this will promote high per-

formance. As a test, I ran an assortment of packs through a calibrated charge/discharge process several times in a single day. In every case, with every type of pack, run time and voltage deteriorated during the second and third cycles.

On the other hand, when the same packs were allowed to rest for a week between cycles, run time and voltage were virtually unchanged from the second to the third cycle. It didn't seem to matter much whether the cells were super high-voltage Sanyo\* 2000's or inexpensive Trinity\* Street Spec packs; the results were the same.

Instead of spending your money on replacement battery packs, pick up enough packs to allow at least several days to pass between uses. Trust me; your packs will last longer!

## STORAGE

People store their packs in all sorts of strange containers—everything from cardboard boxes to plastic bags. Many will do the job, but it's important to ensure that the packs are protected from moisture

and temperature extremes and from being banged around when they're transported from bench to track.



The worst—and most permanent—damage results from dead-shorting a partially charged pack. Fully charged packs can burn or explode if something causes a direct connection between the positive and negative terminals. I've seen guys toss their packs into a metal toolbox or a pit bag with a jumble of loose parts floating around in the bottom and then see their expensive packs fry when an errant screw or spring lodges between the negative and positive battery-plug posts. That's an expensive and dangerous lesson!

While many racers like fabric or vinyl roll-up battery carriers with pockets, I prefer the inexpensive five-compartment nylon fishing-tackle boxes. You'll

find them at sporting-goods and discount stores for a couple of bucks apiece. Each partition is just big enough for a single pack, or two, if they are placed on their sides. I seldom run more than five packs in a single night, but if I plan to run two classes at the parking lot or I'm going away for a weekend of fun, 10 packs will easily see me through. I line the bottoms of the partitions with pieces of thin packing foam so that the packs don't rattle around when the lid is closed.

As you can see, everything I've talked about is simple common sense—no smoke; no mirrors; nothing that sounds at all out of the ordinary. And that, my friends, is probably the best advice that I can give you when it comes to battery maintenance. If a new technique simply sounds too weird to be right, it probably is! Take it easy, play things conservatively, and your new battery packs will maintain their high performance level for years of fun.

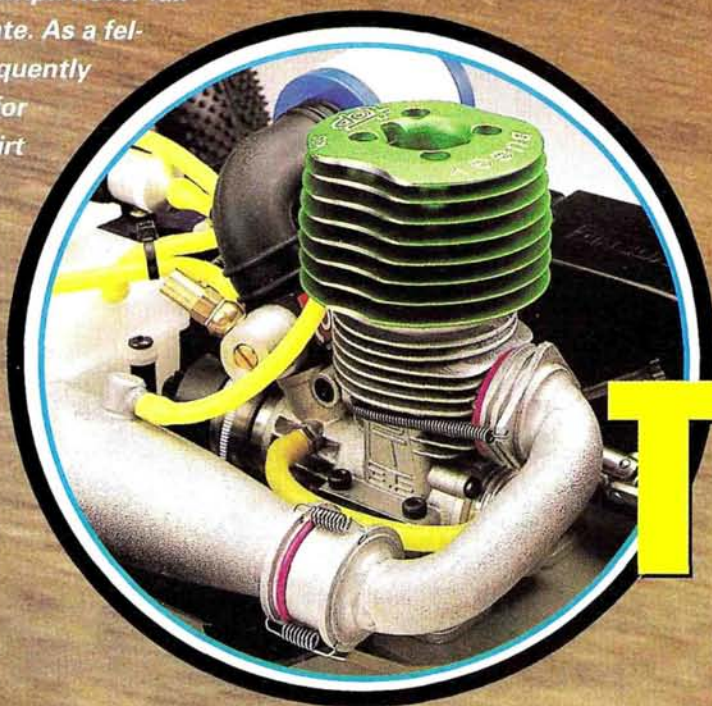
\*Addresses are listed alphabetically in the Index of Manufacturers on page 209. ■



# Kyosho **Inferno** **MP-6** **International**

by Steve Pond

*I love anything radio control—big, small, nitro, or electric; put a transmitter in my hand, and I'll drive it. But if I was ever forced to choose only one type of R/C vehicle for the rest of my R/C career, I would opt for a 1/8 nitro buggy. It represents everything excessive about R/C; the smell of nitro fuel, long run times, excessive power, the dimension of flight and the challenge of taming dirt at speeds in excess of 60mph never fail to double my pulse rate. As a fellow nitro racer so eloquently put it, "Batteries are for flashlights; give me dirt and nitro or give me death!"*



# THE UN



s p e c s

SCALE 1/8  
LIST PRICE \$949

**DIMENSIONS**  
Wheelbase 13.03 in. (331mm)  
Width 11.93 in. (303mm)

**WEIGHT**  
Gross, RTR 113.3 oz. (3,212g)

**CHASSIS**  
Type Channeled plate  
Material Hard-anodized aluminum

**DRIVE TRAIN**  
Type Shaft  
Primary Clutch bell/spur  
Drive shafts Universal  
Differential(s) 4-gear bevel w/molded housing  
Clutch 3-shoe  
Bearings/bushings Bearings

**SUSPENSION (F/R)**  
Type Double A-arm/lower A-arm w/adjustable upper link  
Damping Teflon-coated, oil-filled, coil-over

**WHEELS** (not included)  
Type One-piece plastic

**TIRES** (not included)  
Type Kyosho W5649S

**POWERPLANT** (not included)  
Engine TOP BT21SBK  
Carb TOP slide-type  
Pipe TOP 9853  
Fuel O'Donnell 20% Racing Fuel

**ULTIMATE** MP-6





PAINT BY BICH'N BODIES

## BUILDING & SETUP TIPS

When assembling a nitro-powered car, remember the cardinal rules: be patient and use Loc-Tite\*!

■ When you assemble the differentials, use Kyosho's heavyweight silicone oils to tune the diff action. Start with 7000WT in the center diff, 5000WT in the front diff and 3000WT in the rear diff. I put a little Permatex\* Hi-Temp silicone sealant on the diff housing and the grub screw to prevent the silicone fluid from slowly leaking out.

■ When you install the diffs in their respective housings, take extra care to shim the diffs for proper gear mesh. The ring and pinion gears in the front and rear diff are made of hardened steel that's unlikely to wear quickly enough to compensate for poor gear mesh. The molded diff housings cause a little runout in the ring gear, so it's very important to rotate the gears to determine the proper mesh. If you feel a tight spot when you rotate the input shaft, you'll have to add more shims to open up the mesh.

■ When you've installed the last screw in the diff housings, be sure to check the gear mesh again because installing the screws tends to further tighten the gear mesh.

■ Start with 30WT to 35WT silicone shock oil, and use your best judgment concerning the use of the protective shock boots. I opted to go without them even though I know this will make the shock seals wear out quicker. When installed according to the instructions, the boots make it more difficult for the lower spring retainer to seat properly, and that results in inconsistent spring preload.

■ Before you secure the bottoms of the shocks to the suspension arms, grind flat spots on the lower shock-mounting pins. Make sure the flat spots don't extend to the end of the pin—only to where the setscrew comes in contact with it. If the setscrew loosens, the little shoulder behind the flat spot will prevent the pin from falling out completely.

■ To ensure the best possible handling, keep the car as low as conditions will allow. Don't use the included setscrews to modify ride height. I found that they quickly dig into the tabs on the chassis and have to be constantly readjusted. I used internal shock shims and spring preload to set ride height and suspension travel—more time consuming, but it offers more consistent results.

In my opinion, Kyosho\* has always been at the front of the 1/8-scale pack as far as value, availability, durability and pure performance are concerned. After testing for our "1/8-scale 4WD Nitro Buggy Guide" (December '98 issue), however, I was somewhat disappointed with the MP-5. This was supposed to represent the ultimate competition buggy from Kyosho. Don't get me wrong: this car took top honors at the last four IFMAR World Champs, so it's definitely no pooch. But the MP-5s at that level of competition required the additional purchase of performance-enhancing factory options.

Turnbuckles, a steel main gear, fiber or steel brake disks, a fuel filter, torque rods and a tuned-pipe mount are just some of the basic add-ons. Manufacturers need to balance purchase price against how many go-fast goodies can be included with a kit. I felt, however, that budget concerns were best left for the DXs of the world—not the car that has clinched four consecutive World Championships!

Well, it appears that Kyosho was saving its most thunderous shot for the introduction of the MP-6 (which I only recently discovered stands for "Model Project 6"). The MP-6 is the sixth in a line of very successful competition off-road buggies, and it is without question Kyosho's best effort yet.

The MP-6 line includes the Standard MP-6, which closely resembles the MP-5 but has upgraded geometry and a few performance-enhancing goodies, and the MP-6 International—the no-holds-barred, all-out racing machine; in fact, what the standard MP-6 lists as factory options, the MP-6 International includes as standard equipment (except for a few non-essential items).

Both MP-6 models boast new geometry that includes a chassis that's 6mm longer and 3mm wider, and turnbuckle upper links in the rear instead of upper A-arms. Kyosho is counting on these changes to make the world's most successful 1/8 racing buggy even more formidable by the time the year 2000 World Championships in Las Vegas roll around.

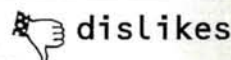
This "Trash Test" focuses on the MP-6 International—the buggy with all the goodies. It has almost 30 more performance- and durability-enhancing components than the standard version. Needless

to say, I just about tackled the UPS guy when he walked through the door with the MP-6 International I was to test. No way would I let this one get away!

- Comes with all the hop-ups.
- Ease of assembly.
- High-quality components throughout.



- Molded diff housings. A buggy of this caliber should have aluminum units.



## PERFORMANCE

For the shakedown runs, we went indoors to Long Island Raceway, NY—a large, premier facility and the site of this year's ROAR Stock Off-Road Nationals. This large track is well-suited to the MP-6, but we knew that because it's indoors, it would make for an interesting day of eye-watering testing.

Firing up the ferocious TOP\* BT21SBK engine is enough to raise the hair on the back of your neck. It's TOP's latest top-of-the-line offering for off-road competition. It features a high-revving short-stroke configuration that suits the MP-6's stock, 13-tooth clutch bell. This highly strung Italian powerhouse barks with the intensity of a junkyard dog, and within the confines of cinder-block walls, it only gets better (or worse, depending on how you look at it).

For the hard-packed surface, I fitted the MP-6 with optional fluorescent yellow wheels and Kyosho's high-traction mini-pin tires (no. W5649S) with rounded foam inserts (no. W5039). This combination proved to be ideal: the MP-6 carried as much velocity through the corners as any car would.

Coming out of the corners, the TOP engine crackled with enough power to lift the front wheels off the ground, and it certainly would have had it not been for the MP-6's hard-working center diff. At the other end of the straight, the four steel disk brakes' fierce binding power just about stood the car on its nose; in fact, on this high-bite track, it required a strong rear brake bias to get it though the corners smoothly.

The longer wheelbase gives the MP-6 greater straight-line stability, and the wider rear stance helps cornering stability.

This car's agility and performance prowess are almost certain to make it a dominant force at the highest levels of international competition. That this is an improved and better-equipped version of the car that garnered four consecutive world titles kind of speaks for itself.

## YOU'LL NEED

- .21 (3.5cc) competition engine.
- Tuned pipe, manifold and coupler.
- Tires, wheels and rear wing.
- Starter box.
- Glow igniter.
- 2-channel radio system (competition-quality FM system preferred).
- Two high-torque servos.
- 20- to 30%-nitro fuel.
- Receiver battery pack.
- Differential/fluid.



### TOP ENGINE AND TUNED PIPE

The brutally powerful TOP BT21SBK engine is made of the best materials and has the best features that you'll find in a buggy engine. It features a five-port configuration with true ABC construction for longevity. A large-volume boost chamber mounted on the rear engine cover is designed to improve low-end throttle response. The engine is coupled to a TOP 9853 tuned pipe. This unique pipe/manifold combination eliminates the need for the flexible exhaust couplers that are prone to being damaged by heat during long races.

### AIRTRONICS M8 RADIO GEAR

The venerable Airtronics M8 is used for guidance; 94257 servos handle the rigorous steering and throttle/brake duties. The sealed radio box is easily accessed by removing a single body clip.

### TRANSPONDER MOUNT

No real racing vehicle would be complete without a transponder mount. This new feature for the MP-6 also includes a smaller hole in the mount for tending to the transponder clip when not in use.

### REMOVABLE RADIO TRAY

The radio tray and receiver housing are easily removed when it comes time to clean dirt and fuel residue from the chassis.

### TURNBUCKLE TIE RODS

A full set of steel "frankenbuckles" allows quick and easy front toe angle and front and rear camber adjustments.

### 3-SHOE CLUTCH

The familiar 2-blade flywheel is fitted with a 3-shoe clutch that features lighter shoes that allow the engine to rev a little higher before it fully engages the drive train. This speeds acceleration, as it lets the engine get into its useful power range before full engagement.

### DISK BRAKES

Four—count 'em—four steel disk brakes stop the MP-6 International (the standard version has two). This makes the braking incredibly strong and more fade resistant. The brake linkage has knurled knobs that allow quick trackside brake adjustments.

### 125CC FUEL TANK

This features a filler-cap-mounted pressure fitting that ensures that fuel isn't spilt during pit stops because the pressure line can't feed pressure into the tank while the lid is open.

### FUEL FILTER

A high-capacity fuel filter and high-quality fuel line are now included in the kit (saves a trip to the hobby shop). I swapped the stock fuel line for General Silicone's\* high-quality fluorescent-yellow tubing (shown) because it matches the wheels and the rear wing.

### HARD-ANODIZED CHASSIS PLATE

The MP-6 International includes a truly hard-anodized 2.5mm channelled aluminum chassis. Hard anodizing makes aluminum more bend-resistant and less easily scratched when it scrapes on the track.

### UNIVERSAL-JOINT DRIVE SHAFTS

The universal-joint drive shafts are very durable and can withstand the rigors of competition.

## TEST GEAR

Airtronics\* M8 transmitter and 94257 servos • TOP BT21SBK engine and 9853 tuned pipe • Nuova Faor\* starter box and glow igniter • O'Donnell\* 20-percent racing fuel • KO Propo\* 600 mAh receiver pack



# FINAL THOUGHTS

I'm entirely impressed with the MP-6 International. It not only has more successful ancestors than any 1/8 buggy in the history of the most prestigious international competition, but in my opinion, it's now more capable of world-class performance right out of the box.

Is the MP-6 perfect? No.

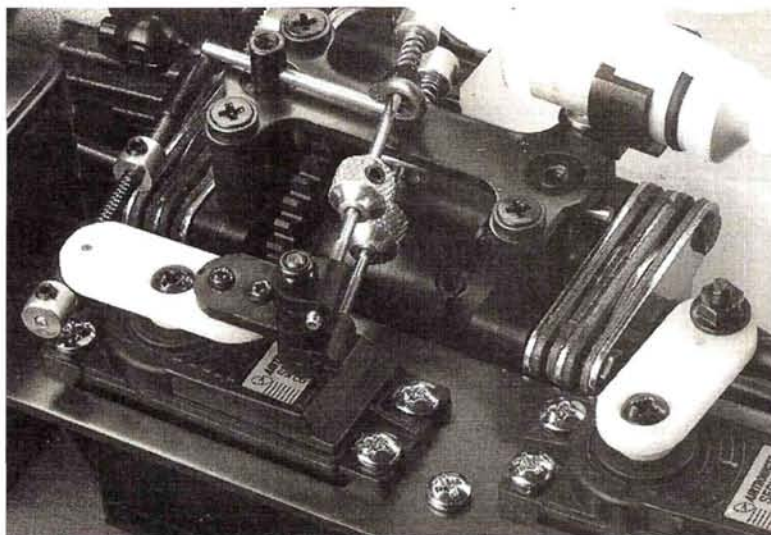
I would like to see more precision in the diff housings to minimize runout in the ring gears.

Further, if you'll allow me to be *really* picky for a moment, I'd also like to see more durable rubber-sealed bearings instead of the shielded variety included in the kit.

The kit is also very "spendy"—way spendy—for the average club racer.

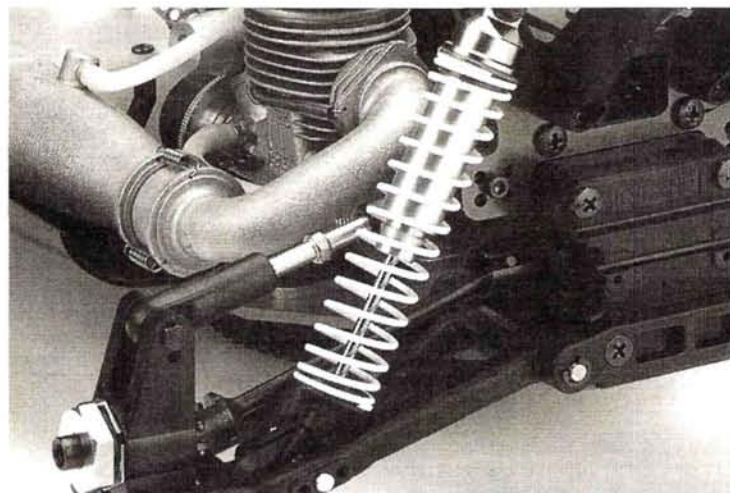
All told, though, I'm kind of splitting hairs (except for the money part). The big picture is that this machine will achieve maximum levels of performance with little if any modification.

\*Addresses are listed alphabetically in the Index of Manufacturers on page 209.

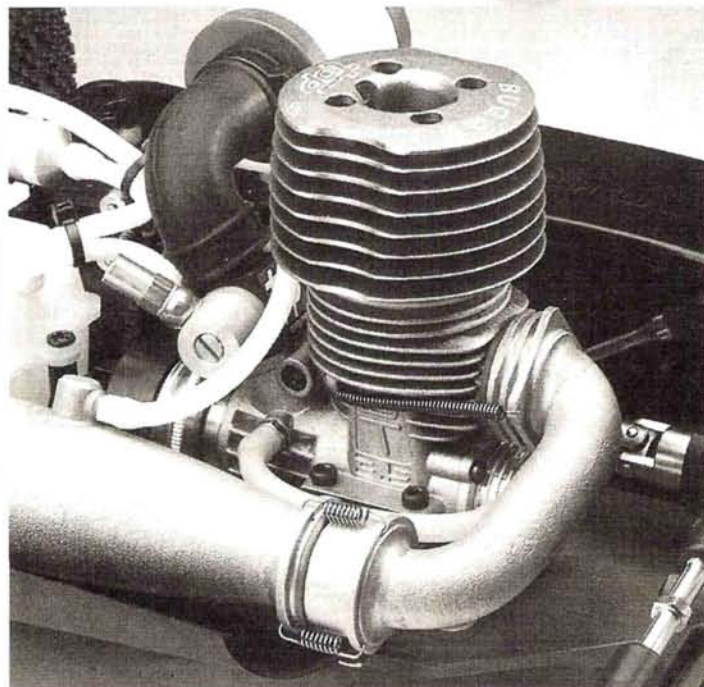


The MP-6 International's much improved braking system features four, vented-steel disk brakes for the best stopping power ever available on an 1/8-scale buggy. Knurled aluminum brake adjusters, a steel main gear and a high-capacity, aluminum-canister fuel filter are all standard with the International kit.

To exact the maximum performance from the servos, a 5-cell Ni-Cd receiver pack is essential. The 600mAh KO Propo pack shown here is ideal for most situations, but a higher capacity pack should be used for 1-hour Mains.



The most noticeable rear-suspension change is the use of adjustable upper links instead of the old upper A-arms. Turnbuckle tie rods, steel shock mounts and steel universal joints are among the kit's many performance-enhancing accessories. Note the rear hex hubs; they are wider, and that gives the MP-6 a more stable rear stance.



## THE COMPETITION

	Kyosho MP-6 International	Laro D2 Diablo	Mugen MBX-4
Wheelbase	13.03 in. (331mm)	12.7 in. (322mm)	12.8 in. (325mm)
Width	11.93 in. (303mm)	12.5 in. (318mm)	12.05 to 12.2 in. (306 to 310mm)
Weight	113.3 oz. (3,212g)	121 oz. (3,464g)	119 oz. (3,400g)
Diff type	Sealed	Non-sealed	Sealed
Brakes	Vented steel (4)	Fiber (2)	Vented steel (2)
Exhaust	Not included	Not included	Not included
Available at*	\$710	\$410	\$470
Reviewed in	5/99	8/98	1/99

\*Prices vary with location

If you're looking for tremendous horsepower, the TOP BT21SBK engine should be at the top of your "A" list. Even though the engine is a high-revving, short-stroke model, it has very controllable bottom-end power. The unique header/pipe combination doesn't allow the subtle pipe-length changes allowed by the conventional silicone coupler, but it prevents those race-ending blowouts. Note the TOP tuned pipe's integral pressure fitting.







thrash  
TEST  
1/8 scale gas

BULBASTIC

## OFNA by Peter Vieira **Monster Blazer**

**S**ome things are just meant to go together. Peanut butter and jelly. Han Solo and Chewbacca. Saturday morning and cartoons. Add .21 engines and monster trucks to that list. Could there be a better match for a big-block nitro mill than a power-hungry, chevron-treaded crusher? Probably not, if you ask OFNA\*. The popular low-dough, lotta-go company sets out to tame any terrain by combining .21 power, an 1/8-scale buggy chassis and massive monster treads into one loud fun-runner—the Monster Blazer.





CUSTOM PAINT BY MOTION GRAPHICS.

## s p e c s

SCALE 1/8  
LIST PRICE \$375.95

**DIMENSIONS**  
Wheelbase 13 in. (320mm)  
Width 19.7 in. (500mm)

**WEIGHT**  
Gross, RTR 142 oz. (4,015g)

**CHASSIS**  
Type Double deck  
Material Aluminum

**DRIVE TRAIN**  
Type Shaft  
Primary Clutch bell/spur gear  
Drive shafts Dogbones  
Differential(s) Bevel gears (3)  
Clutch Centrifugal 3-shoe  
Bearings/bushings Bearings

**SUSPENSION**  
Front Upper/lower wishbone  
Rear Lower A-arm/upper link  
Damping (F/R) Aluminum, oil-damped,  
coil-over shocks

**WHEELS**  
Type Molded one-piece

**TIRES**  
Type Chevron-tread "monster"

**POWERPLANT**  
Engine Not included  
Pipe ORNA aluminum tuned-  
style/expansion chamber  
Fuel Not included

**RADIO GEAR** Not included





## LOWER A-ARM/UPPER-LINK REAR SUSPENSION

Nothing unusual at first glance, but close inspection reveals some interesting features. The inboard hinge pins are held in place by cam-shaped inserts that may be rotated to provide zero or 3 degrees of toe-in. Giant pivot balls enclosed by oversize rod ends anchor the threaded camber links.

## 3-DIFF DRIVE TRAIN

Like most 1/8-scale buggies, the Monster Blazer features front, center and rear differentials. Steel ring gears encircle the plastic front and rear diff cases, and the center diff features a steel main gear. That's a nice upgrade not featured on the Ultra GT LX buggy. It's also a wise upgrade, since the Monster's oversize tires put extra stress on the main gear. All three diffs feature bevel-gear internals, and dogbones are used between the diffs and hubs on all corners.

## ALUMINUM BUGGY CHASSIS

The Blazer nameplate isn't quite accurate, since the truck is actually built on OFNA's Ultra GT LX platform. That means plenty of blue-anodized aluminum in a double-deck configuration with a removable, one-piece radio tray and flat main chassis plate—zero kick-up. The lower plate is 3mm thick with countersunk holes, and the upper deck pieces are 2mm thick. Aluminum standoffs join the plates.

## WISHBONE FRONT SUSPENSION

The Monster Blazer's front hubs turn on pivot balls, eliminating the need for hub carriers. This setup allows a little caster adjustment by changing the position of a single clip-on spacer on each upper arm's inboard hinge pin. Camber is adjusted via threaded rods in the upper arms.

## FORCE 6-PORT ENGINE

OFNA sent along a Force P6 engine to outfit the Monster Blazer, which does not include an engine. I would have preferred a pull-start powerplant, but no biggie; I have a starter box. The Force engine includes a conventional 2-needle, slide-valve carb and features a pre-tapped hole in the case for an optional boost bottle. The air cleaner shown is included with the truck kit.

## INCLUDED PIPE AND MANIFOLD

These parts won't win any beauty contests, but they work well, are solidly constructed and arrive in the box. The icing on the cake would have been a pre-installed pressure fitting, but you can't have everything. You'll have to drill the pipe yourself, but the fitting is included.

## 125CC FUEL TANK

There's nothing thirstier than an overgeared .21 engine, so the Blazer's large tank is a welcome sight. Expect to drain the tank after about eight minutes of hard running.

## YOU'LL NEED

- 2-channel radio system with heavy-duty servos.
- Starter box or bump-starter.
- .21 rear-exhaust engine.
- Fuel.
- Heavy grease.
- Glow plug.
- Glow-plug igniter.

## FACTORY OPTIONS

- Front Y brace—part no. 30660.
- Aluminum center diff mounts—31060.
- Aluminum steering bellcranks—31220.
- CNC machined-aluminum engine mounts—31190.
- MIP\* CVD universal drive shafts—30071.

## ALUMINUM SHOCKS

Plastic-body shocks have all but disappeared from 1/8-scale vehicles. The Monster's machined-aluminum units are bladder-equipped and function well. Preload spacers are provided, and silicone oil is included. The damping is just about right with the stock oil.

## TEST GEAR

- JR R1 radio • JR Z4750 Ultra Race steering servo • JR 2750 Super Race throttle/brake servo • Team Orion\* receiver pack • Dynamite\* Blue Thunder 20-percent-nitro fuel • OFNA Force 21 P6 engine.



## PERFORMANCE

After I had followed the usual break-in procedure, the Monster Blazer was ready to tear up Bethel Supercross (in Connecticut). Our favorite BMX haunt was in rough shape thanks to a winter's worth of rain, snow and neglect, but that only meant a bigger challenge for the Monster.

Before even hitting the dirt, I wound up the big truck on pavement. Since the truck does not use a gear-reduction unit, the monster-size tires make for an extra-tall final drive ratio. The Blazer took a somewhat long run to reach top speed, but it was haulin' when it maxed out at 45mph. Believe me, 45mph seems super-sonic when it's a monster truck that's reeling in the pavement. Once I had my speed fix, I was ready to take the action off-road. The tall gearing worked against the truck and caused it to labor hard when climbing hills. To get the most from the Blazer MT, keep that engine revving.

■ Although the front and rear gearboxes and center diff arrive installed on the chassis, a bright yellow notice in the kit informs the buyer that they must be removed for lubrication and that additional grease should be added to the bevel gears within the diffs. What a pain! I found the diff internals satisfactorily greased despite the notice, but the diffs' ring gears and drive pinions were bone dry. I used some Phil Wood bicycle grease (hey, it was handy) to lube them.

■ You'll have to drill and tap a hole for the pressure fitting in the exhaust pipe. I recommend that you use some high-temperature epoxy to attach and seal the fitting (JB Weld—distributed by Great Planes\*—and Liquid Steel are good brands).

■ Manifold springs are always a hassle to install. Pliers always seem to lose their grip just as the spring is almost stretched into place, so I bought a tool from FSR\* to do the job. It's nothing more than a hook with a short handle, but it's just what you need to pull the spring around the head and over the manifold's flange.

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■ Use heavy-duty servo horns for better control. Aftermarket horns from Kimbrough\*, Sonic Tronics\*, or OFNA are all good choices.

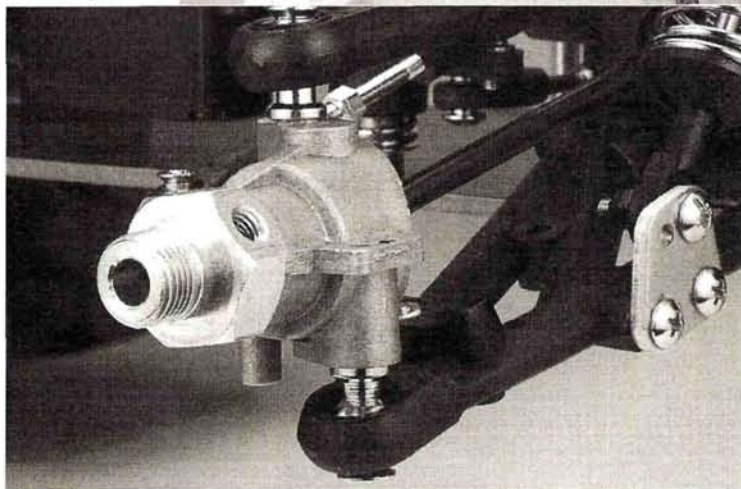
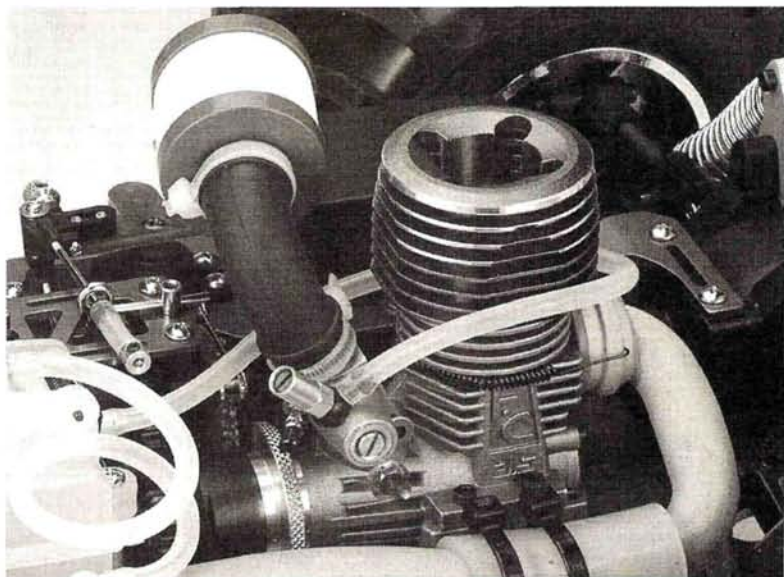
■ Small bump-stops attached to the lower front-suspension arms still allow enough steering travel for the front drive shafts to pop out of their cups. To limit steering travel further, install the left bump-stop on the right arm and vice versa.

■ The Monster Blazer's giant tires guarantee plenty of ground clearance, so there's no need to jack up the suspension. Do the dogbones a favor and set the truck so the arms are level when the truck is at resting ride height.

■ Use Loctite\* on all the diff-outdrive setscrews.

## BUILDING &amp; SETUP TIPS

*The Force 6-port engine ran well once the carb had been properly sealed. The manifold, tension spring and silicone coupler are all included with the kit—no trips to the hobby shop for odds and ends required!*



*Notice something missing? There's no hub carrier. The offset pivots provide caster, and spacers on the upper wishbone's hinge pin allow additional caster to be dialed in (or out). Note the plate used to mount the shock pivot.*

- Fast and burly.
- Unflappable handling.
- Good-looking body.
- Pipe and manifold are included.



Likes

- Otherwise convenient factory assembly must be undone so front and rear gearboxes may be lubed.
- Flexible steering bellcranks hamper steering precision.
- Instructions need much improvement.



dislikes

Handling was reasonably precise for a vehicle with such massive tires, but the Monster Blazer would steer better with stiffer bellcranks; OFNA's aluminum units are a popular upgrade for the buggy version of the Blazer and would also be ideal for the Monster mode. Unsurprisingly, the dual, fiber disk brakes paired with the muscular JR\* Z2750 Super Race servo provided powerful stopping.

No trip to Bethel Supercross would be complete without a full-clamp run at the Big Jump, and I was eager to initiate the Monster Blazer into the brotherhood of big air. As soon as the big truck began to spool up, I knew the jump would be "wincer"; it was just too fast. The Monster Blazer bot-

tomed out hard at the base of the jump, unloaded as it cleared the lip and arched over into a death dive from about 15 feet up. I held on to the faint hope that the truck would turn a complete somersault and land on all fours, but it didn't happen. It just barely made it to perpendicular with ground zero before augering in nose first. The right front dogbone ejected, the flat chassis plate suddenly developed some kick-up, and Bethel Supercross was given a fresh pothole in the front straight. I expected a gruesome postmortem but was pleasantly surprised to find no day-ending damage. The bone was reinstalled, and the Monster Blazer was back in action—with a slightly reconfigured chassis.

## FINAL THOUGHTS

For the monster-truck buff with some R/C experience and a penchant for aggressive off-roading, OFNA's ground-pounding Monster Blazer is an entertaining piece of equipment. It's tough and fast and relatively easy to handle. Beginners are better off starting with a more user-friendly 1/10-scale machine, but the Monster is a good second nitro vehicle for someone who's a little higher on the gas-power learning curve.

\*Addresses are listed alphabetically in the Index of Manufacturers on page 209.





# Schumacher **S.S.T. '99 Pro**

by Peter Vieira

**S**chumacher's\* S.S.T. occupies an unusual position in the touring-car landscape. It has not had a ground-up redesign since its inception but has relied on continual revisions from year to year; for this reason, you might think it's less cutting-edge than newer sedan designs. The original S.S.T. was ahead of its time, however, and the evolutionary changes it has undergone each year have kept it on the crest of touring-car technology. Further refined for '99, the latest iteration of the S.S.T. is a quietly innovative car that blends equal measures of "classic" touring-car design and "why-didn't-I-think-of-that" engineering. The S.S.T. '99 Pro is also more durable and convenient to maintain, so it should be a pleasure both on and off the track.

PHOTOS BY WALTER SIDAS



# s p e c s

SCALE 1/10  
LIST PRICE \$229.99

**DIMENSIONS**  
Wheelbase 10.1 in. (257mm)  
Width (F/R) 7.48 in. (190mm)

**WEIGHT**  
Gross, RTR 50.7 oz. (1,437g)

**CHASSIS**  
Type Double-deck plate  
Material Fiberglass

**DRIVE TRAIN**  
Type Dual belt  
Primary Pinion/spur  
Drive shafts Plastic "blade"  
universal  
Differential(s) Ball  
Bearings/bushings Bearings

**SUSPENSION (F/R)**  
Type Upper/lower wishbone  
Damping Aluminum oil-filled,  
coil-over

**WHEELS**  
Type Molded one-piece  
5-spoke  
Dimensions (DxW) 2x1 in. (51x24mm)

**TIRES**  
Type Schumacher  
white-dot rubber

**ELECTRICS (not included)**  
Motor Peak Nightmare stock/  
Peak EBX-Pro/3x3 modified  
Battery Schumacher Matched 2000  
ESC Novak Atom



# REVISED RACER







### DEDICATED-SPUR GEAR

If you want to use your collection of "two-hole" spur gears on the '99 Pro, you're outta luck. The Pro must use the keyed spur that is included with the kit (or Schumacher replacements). An adapter is available, but in the meantime, the kit spur will mesh with "standard" 48-pitch pinions.

### QUICK-RELEASE BATTERY STRAPS

I've long admired Schumacher's simple yet effective battery hold-down system. The straps simply won't let go no matter how painfully hard the car is slapped on the boards, yet the cells are instantly released with a tug. Additional pieces are included with the kit to accept stick packs.

### SIDE-SADDLE CHASSIS

Although Schumacher refers to the S1 chassis material as "carbon composite," and it does have the woven appearance similar to what one expects of "carbon fiber," the parts flex like fiberglass and produce the same white epoxy dust as fiberglass when filed, so I'm inclined to call them fiberglass. Not that that's a negative; the '99 Pro's chassis is non-conductive and suitably stiff with the top deck in place. The lower chassis plate features Schumacher's unique side-saddle layout, which allows convenient battery loading and close-to-center weight distribution. The top plate is a new version of the previous "slim" design; the new part is slightly wider than its predecessor and supports only the servo-saver-equipped bellcrank (the previous design supported both bellcranks).

### NEW HUBS WITH LARGER BEARINGS

The '99 Pro now uses 5x10mm bearings in the hubs instead of the more delicate 5x9mm units found in older S.S.T.s. Although this does not impact the "feel" of the car, the larger bearings will increase durability.

### "ULTRA-SHORT" SHOCKS

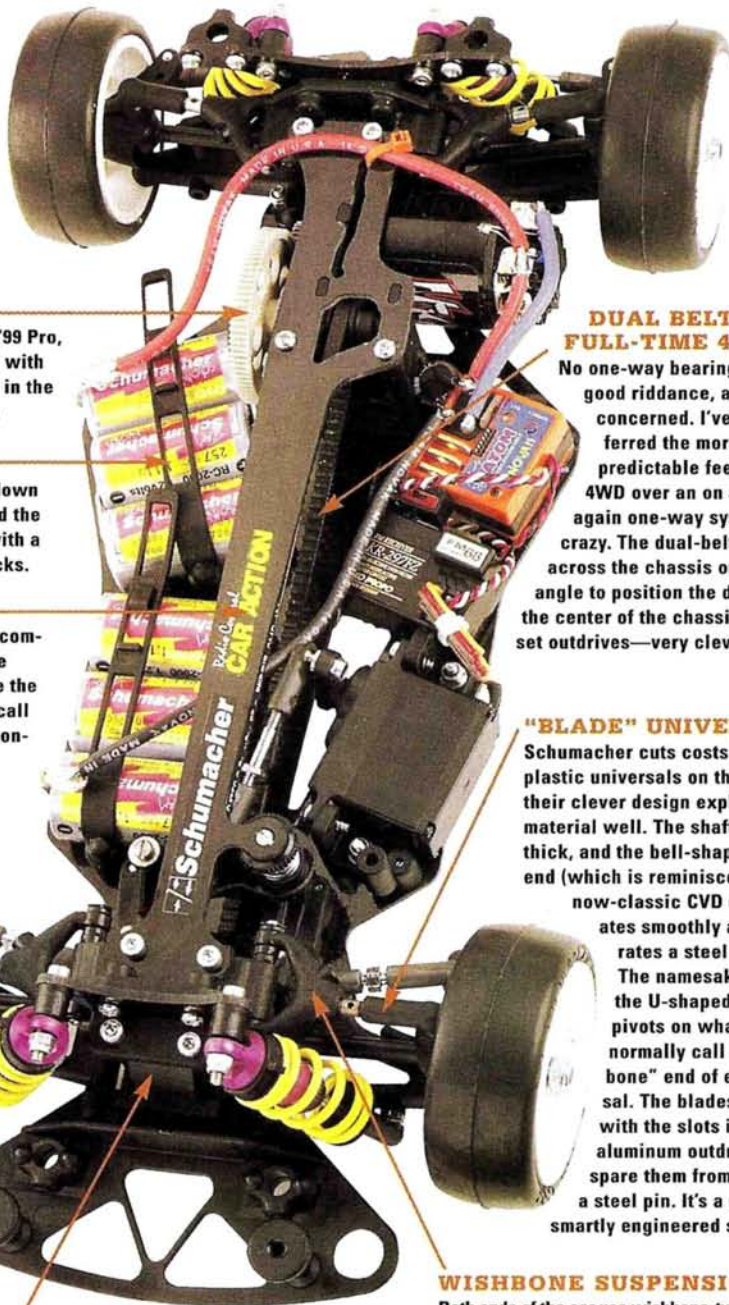
New, shorter shock bodies and shafts allow downsized shock towers and a lower center of gravity overall, which should help the S.S.T. handle predictably when transitioning between turns. Extremely stiff springs are supplied, and clip-on collars adjust preload. Schumacher's Vari-shock adjustable pistons and foam volume-compensation sleeves are used within the shocks. A funky green oil is supplied; I opted for Schumacher's aftermarket silicone oils.

### YOU'LL NEED

- Transmitter and receiver.
- 190mm body.
- Electronic speed control.
- Steering servo.
- Motor.
- CA.
- Saddle-style battery.
- Pinion gear.

### FACTORY OPTIONS

- Alloy gear adapter—part no. U2014.
- Front bumper and foam—U2021.
- Alloy transmission housing (3-piece)—U2034.
- ABS adjustable braking system—U2101.
- Steel drive shafts for pin axle—U2151.
- Alloy hub carriers for pin axle—U2163.
- Titanium hardware set—L1908.



### DUAL BELT, FULL-TIME 4WD

No one-way bearings here—good riddance, as far as I'm concerned. I've always preferred the more forgiving, predictable feel of full-time 4WD over an on again/off again one-way system; call me crazy. The dual-belt setup slices across the chassis on a shallow angle to position the diff pulleys in the center of the chassis without off-set outrives—very clever, indeed.

### "BLADE" UNIVERSALS

Schumacher cuts costs by specifying plastic universals on the '99 Pro, but their clever design exploits the material well. The shaft portion is thick, and the bell-shaped universal end (which is reminiscent of MIP's now-classic CVD design) operates smoothly and incorporates a steel stub axle. The namesake "blade" is the U-shaped yoke that pivots on what you would normally call the "dog-bone" end of each universal. The blades interface with the slots in the diffs' aluminum outrives and spare them from the wear of a steel pin. It's a unique and smartly engineered setup.

### WISHBONE SUSPENSION

Both ends of the car use wishbone-type suspension arms that eliminate hub carriers and their attendant hinge pins in favor of a direct link between hub and suspension arm via pivot balls. This system allows rear toe to be adjusted via turnbuckles, just as one would adjust front toe; in fact, the '99 Pro uses "front" hubs on all corners! One would expect a fair amount of flexing in the system, given the lack of hinge pins, but the stiff upper arms effectively support the hubs and resist torsional loads well. In addition to rear toe, the Pro's suspension allows front caster to be adjusted by varying the position of spacers on the front upper arms, and all four lower arms incorporate setscrews to adjust down-travel.

### PRE-ASSEMBLED BALL DIFFERENTIALS

I have to confess that I've never built a Schumacher diff; they arrive assembled (make that well assembled), so I've never had the need. It wasn't until Acer Racing\* sent a set of its hardened 4mm diff balls (labeled "For Schumacher") that I realized just how huge the S.S.T.'s diff balls are! I have to believe the oversize balls help with smoothness and durability. When the diffs eventually need to be rebuilt, I'll try the Acer balls.

### PERFORMANCE

Before taking the '99 Pro out for some carpet racing, I glued up the kit-supplied rubber and did a little parking-lot testing with the base settings suggested by the manual. Out of the box, the S.S.T. is very

neutral-handling, as evidenced by its straight tracking under power and predictable cornering. Although conventional wisdom holds that full-time 4WD tends to cause understeer, the S.S.T. turned in capably. It's just a little loose when exiting

### TEST GEAR

- Novak\* Atom ESC • Peak\* Nightmare stock motor • Peak 13x3 EBX Pro modified motor
- Schumacher matched Sanyo 2000 cells • TRC\* foam tires • KO\* Mars transmitter and KR297FZ receiver • JR\* Z550 Premium Race servo • Schumacher Volvo S40 body.





turns, but the oversteer is easily controlled with the throttle. Like most belt-drive chassis, the '99 Pro ran whisper quiet and accelerated crisply; the lightweight aluminum diff outdrives and plastic universals no doubt contributed to the punchy feel at the trigger.

Once set up for carpet competition, the S.S.T. went from Dr. Jekyll to Mr. Hyde; it was ridiculously loose—nearly undrivable. After monkeying around with spring rates and tire compounds, I discovered the source of my difficulties: after I lowered the ride height for the carpet and readjusted the camber settings, I did not check the front-toe setting. The car had about 1 degree of toe-out, which accounted for the silly steering. When I dialed the front end back in, the S.S.T. showed the same neutral handling as it had presented on the pavement.

## FINAL THOUGHTS

The Schumacher S.S.T. '99 Pro is a reliable, highly adjustable racecar with capable performance straight from the box. I'd like to see the optional foam front bumper and aluminum heat sink/motor plate included as standard equipment, but the '99 Pro still ranks among the less expensive race-ready tourers, even if the aforementioned upgrades have to be purchased separately. The kit's parts are all of high quality, and everything fits together well (provided you use the correct Pozzi screwdriver). If you're in the market for a competition tourer, put the S.S.T. '99 Pro on your shortlist.

- Pre-assembled diffs and upper wishbones.  **likes**
- High-quality materials and construction throughout.
- More adjustable than most other sedan kits.
- Convenient battery system accepts stick or saddle packs.

- Does not accept "standard" spur gears  **dislikes** (adapter available separately).
- Long-shank pinion required to fully mesh with kit spur.
- Foam bumper and aluminum motor plate/heat sink not included.
- Pozzi screwdriver required for uncommon Pozzi screws.

Although extensively illustrated with CAD drawings, the S.S.T. '99 Pro's manual is very light on text. Because of this, some finer points of assembly are not well emphasized, and a careful eye is required. The following should help clear up any ambiguities. Overall, you can expect a pleasant build.

■ Page 3: I had difficulty assembling the seal housings, foam volume compensators and bobbins; the foam squeezed out over the bobbin and interfered with its fit in the seal housing. I remedied this by trimming about 2mm from the width of each foam strip.

■ Pages 5 and 7: the instructions call for ball studs to be fitted into the ends of the suspension arms. It's practically impossible to snap them in by hand, but that's no problem; they'll pop into place when you thread them into the hubs.

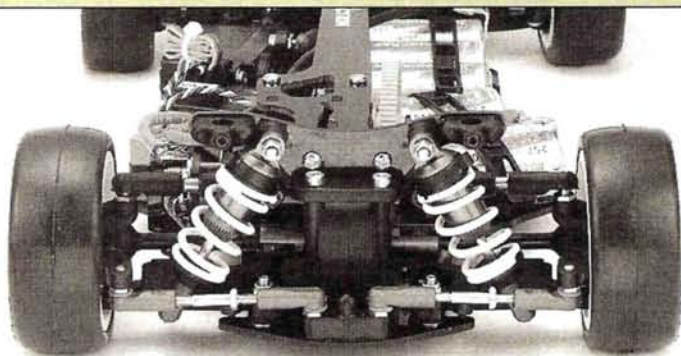
■ The '99 Pro's upper wishbones are pre-assembled with turnbuckles, but Schumacher did not take pains to install the turnbuckles as "lefts" and "rights"; note which way each turnbuckle must be turned to increase or decrease camber, and label them accordingly with a dot of permanent marker. I also found that one of the turnbuckles did not operate freely and would pop off the ball cup instead of allowing it to turn; to remedy this, I simply threaded the turnbuckle in and out a couple of turns to free it up.

■ Rear toe can be measured with an RPM\* camber gauge; just stand the car on end.

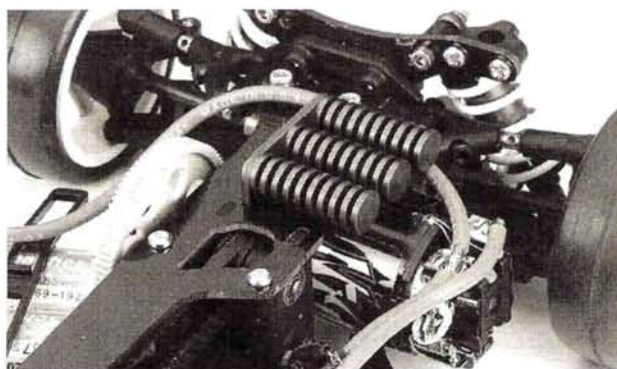
The chassis' rounded end won't allow it to sit "square," but if you lean the car back until the shock-mounting screws touch the bench, they will form a flat "base" along with the rear tires' contact patches.

Although touring-car racing is usually linked to the parking-lot milieu, I most often race sedans on carpet. Since I had an Ozite excursion planned for the S.S.T. '99 Pro, a change of treads was required; the kit-supplied 5-spoke hoops and white-compound rubber were set aside for paved action, while a fresh set of TRC green-dots found homes on the corners. I also lowered the car by removing all preload spacers except for 1mm slivers at the front left corner and right rear corner to correct a slight "tweak" due to my choice of lightweight electronics. To compensate for the extra sag, I used the suspension arms' setscrew travel limiters to dial down travel, and that saved me from having to crack open the shocks to add spacers under the pistons. I used the kit springs, but passed over the supplied mystery oil in favor of Schumacher's nicely packaged silicone oil (I used 100WT with the Vari-shock pistons set at two holes open). Finally, all four wheels were set for -1 degree camber, the front end was set with 1 degree toe-in, and the rear was set for 2 degrees toe-in.

**Rear toe is infinitely adjustable via turnbuckles. The setup permits very fine adjustments to be made, but one must be very careful to adjust both sides equally! A set of calipers helps.**



**The ball diffs arrive pre-assembled. Note that the diff pulley is perfectly centered between the outdrives; the Pro's angled drive train eliminates the need for offset diffs.**



**I installed Schumacher's optional metal motor plate and "tootsie roll" heat sinks. I'd like to see these included with the kit. Am I hinting loudly enough?**

## THE COMPETITION

	Team Losi STREET WEAPON	Yokomo YR4M2 USA	Kyosho TF-3 TYPE R	HPI RS4 PRO	Schumacher S.S.T. '99 PRO	OFNA Z10	Roadrunner XPRESS PRO
Wheelbase	10.19 in. (259mm)	9.94 in. (252mm)	10.1 in. (257mm)	10 in. (254mm)	10 in. (254mm)	10.15 in. (258mm)	10.25 in. (260mm)
Width	7.25 in. (184mm)	7.19 in. (183mm)	7.5 in. (191mm)	7.25/7.125 in. (184/181mm)	7.48 in. (190mm)	7.48 in. (190mm)	7.4 in. (187mm)
Diff type	Ball	Ball	Ball	Ball	Ball	Ball	Ball
Chassis	Composite	Graphite	Graphite	Graphite	"S1" Fiberglass	Graphite	Graphite
List price	\$349.95	\$380	\$399.99	\$329	\$369	\$379.95	\$450
Available at*	\$225	\$229	\$290	\$260	\$225	\$215	\$289
Reviewed in	12/97	11/98	2/99	10/97	5/99	4/97	4/97

Partial list only; product category is too large to list all competitive vehicles

\*Prices vary with location.

\*Addresses are listed alphabetically in the Index of Manufacturers on page 209.



# MRC SP3 *Extreme*



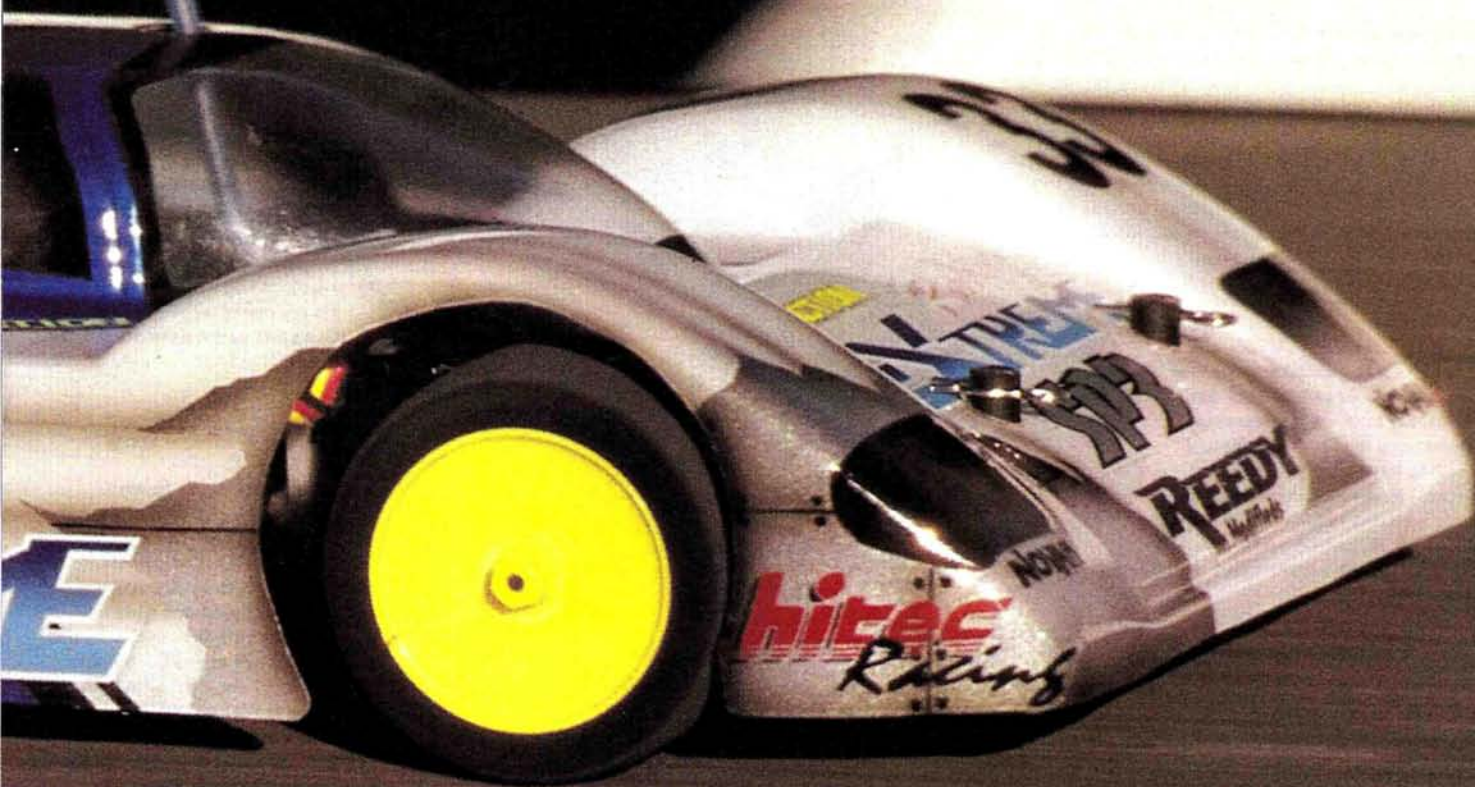
by George M. Gonzalez





# Low-Buck On-Road EXCITEMENT

Getting into on-road R/C has just become easier—and certainly more affordable—with the release of Academy's new SP3 Extreme. Imported by MRC\*, this new, pan-style car is patterned after 1/12-scale racers yet arrives 90-percent assembled with a forward-and-reverse mechanical speed control (MSC) and an easy-to-handle, 380-size motor installed on the motor pod. Although the SP3 is aimed toward first-time racers, with a little wrenching and some smartly chosen factory hop-ups, it can be transformed into a competition-worthy vehicle that just might surprise you. If you're interested in seeing how much fun you can get for your dollar these days, read on.



## s p e c s

SCALE 1/12  
LIST PRICE \$79

**DIMENSIONS**  
Wheelbase 7.75 in. (197mm)  
Width (F/R) 6.58 in. (167mm)

**WEIGHT**  
Gross (as tested) 31 oz. (901g)

**CHASSIS**  
Type Pan  
Material Molded plastic

**DRIVE TRAIN**  
Type Direct drive  
Transmission Straight steel axle  
Differential Ball  
Slipper clutch None  
Bearings/bushings Plastic bushings

**SUSPENSION (F/R)**  
Type Independent coil spring/  
flat T-plate  
Damping Coil springs/in-line friction  
shock w/left and right  
grease-filled side dampers

**WHEELS (F/R)**  
Type One-piece plastic  
Dimensions (DxW) 36x26mm/36x38mm

**TIRES (F/R)**  
Type Medium-compound foam

**ELECTRICS**  
Motor 380-size closed endbell  
included (also accepts  
540-size motor)  
Battery Not included  
ESC Mechanical resistor-type  
w/forward and reverse  
included



## MRC SP3 EXTREME



### WHEELS, TIRES AND BODY

Medium-compound foam tires and cool-looking bright yellow wheels are included. Soft-compound tires are available from MRC, but aftermarket 1/12-scale donuts will fit well. Standard 1/12-scale wheels can be bolted onto the rear axle; however, standard front wheels will not work on the SP3 because the wheels use metric bushings. The included WSC body looks sharp and is designed for short-track racing.

### FLOATING REAR POD

The SP3 features a floating rear motor pod that's conventional except for the fact that all of its components, including the motor mount and T-plate, are made from molded plastic. A molded adapter allows the smaller and less powerful 380-size motor to be used; however, a more powerful 540-size motor can be bolted on without modification. A single, non-rebuildable in-line shock aids the T-plate with fore and aft damping, while side dampers provide lateral damping. Ride height and wheelbase adjusters are provided for the rear end as well.

### MOLDED PAN CHASSIS

The SP3's flat, molded chassis will accept stick- or saddle-pack batteries. For ultimate performance, I recommend the latter, but the car handles fairly well with stick packs. The molded chassis flexes quite a bit, but I didn't notice any ill effects on its handling when I tested the vehicle with a ROAR stock motor bolted on the motor mount.

### FACTORY ASSEMBLY

The SP3 arrives 90-percent assembled, which considerably cuts down building time. Don't worry, though; you'll still have to mount the tires, install the body mounts, paint the body and install your radio gear, so there's plenty of stuff left for you to do.

### FACTORY OPTIONS

- Duraluminum diff hub—part no. EXT 02.
- Duraluminum wheel hubs (right/left)—EXT 01/EXT 03.
- Racing oil damper—EXT 04.
- Side damper mounts—EXT 09.
- Diff thrust cone—EXT 08.
- T-plate pivot balls—EXT 07.
- Soft-compound foam tires (F/R)—EXT 17/EXT 18.
- Turnbuckle camber rods—EXT 15.
- 1060 flanged ball bearings—EXT 06.
- 630 flanged ball bearings—EXT 05.
- 1060 ball bearing—EXT 19.

### YOU'LL NEED

- 2-channel radio system with two servos (one for steering and one for the mechanical speed control).
- 6-cell stick or saddle battery pack.
- Battery charger.
- Polycarbonate paint for the body.
- Contact cement for gluing tires to the wheels.

### DIRECT-DRIVE AXLE

The SP3 uses a conventional direct-drive system with a straight steel axle, 4-bolt molded wheel hubs and an adjustable ball diff. A 76-tooth spur gear and a 20-tooth, 48-pitch pinion gear are also included. Many cool, purple-anodized Duraluminum drive-train parts are available from MRC; they will improve the car's performance as well as its appearance.

### MECHANICAL SPEED CONTROL AND 380 MOTOR

The mechanical speed control will get you on the road economically, and its reverse feature will undoubtedly appeal to newcomers. The included 380-size motor gets the SP3 rolling quickly, but its top speed wasn't enough to please this speed demon!

### ADJUSTABLE FRONT SUSPENSION

The upper arms feature threaded rods that allow trackside camber adjustment. The optional adjustable turnbuckles make the task much easier. Upper arm spacers allow a variety of caster choices, and two upper arm mounts (zero and 4 degrees) allow the tuner to add dive or anti-dive characteristics to the front suspension. Easy-to-access kingpin coil springs provide the damping, and the kit also includes ride-height adjustment shims to complete the tuning package.

### PERFORMANCE

A small shopping center with a freshly laid asphalt parking lot was my test site. Since the parking lot is well-lit at night, I decided to set up a small roadcourse with corner markers so I'd be able to do my testing in the evening, when traffic was light. MRC was kind enough to supply us with a couple of cars—one completely stock and the

### TEST GEAR

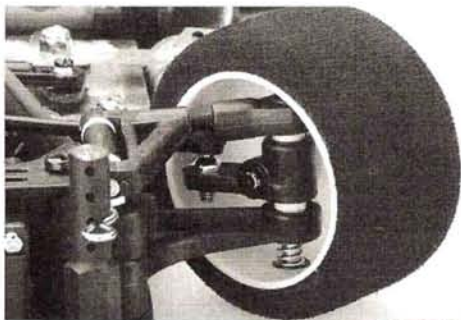
Hitec\* Lynx AM radio set • Hitec\* HS303 steering- and speed-control servos • Trinity\* Amp Max II 1500mAh sport pack.



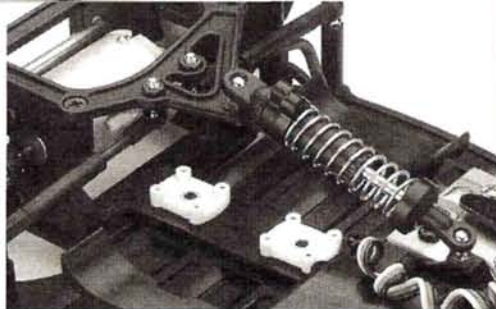
other, I modified with factory hop-ups and racing-oriented radio gear and electronics (see the "Hopping-up the SP3" sidebar for details on the modified car).

The stock SP3 accelerated quickly and reached its top speed within a few seconds. Although piloting the SP3 wasn't a white-knuckle experience, it had more than enough speed to tackle the more technical portions of my temporary track, and run times with the little 380 motor seemed eternal. Although the reversing MSC allowed me to perform some nifty "speed racer"-type maneuvers, the absence of brakes and the car's instant reverse made it a handful to drive. The included MSC was more of an annoyance than a benefit, but I'm sure most beginners will be happy to have reverse. I would have preferred a forward with brake speed control, but that's my opinion. Overall, the SP3 handled admirably and would make a fine spec-class racer for newcomers or anyone looking for close competition on the cheap.

Next, it was time to test the SP3 in modified trim. The difference between the two cars was astonishing. The modified SP3 was ballistic yet easier to control, thanks to the Novak\* Tempest Max ESC. The car tracked like an arrow; it darted into and out of corners, although exiting corners required precision throttle control to keep the rear tires planted. Although MRC is not targeting the racing crowd with the SP3, I'm confident that with some tuning and some smartly placed hop-ups, it could be raced in the stock class.



**The SP3's front suspension is similar in design to Associated's Dynamic Strut suspension. Caster, camber and ride height are all adjustable, and optional upper suspension-arm mounts add reactive caster, or dive, to the front suspension.**



**The single, in-line-mounted shock is not rebuildable, but it works well; the plastic T-plate also works surprisingly well. The side dampers really help smooth out the car's ride, but the kit does not include the grease that's necessary to make them work properly.**

- Low price.
- Almost ready to run.
- Awesome-looking GTP-style body.
- Plenty of tuning options.
- Many factory hop-ups.



**Likes**

- Reversing mechanical speed control makes performance-oriented driving difficult.
- Excessive chassis flexing.
- 380 motor is ... well, wimpy.
- Molded motor mount does not dissipate heat very well.



**dislikes**

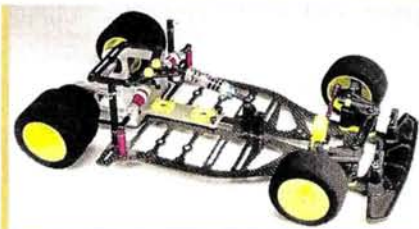
**Hopping up the SP3** T ricking out the SP3 was easy, thanks to the many hop-ups that are available through MRC and the roomy chassis that can accommodate just about any combination of electronics. My first modification was to remove the mechanical speed control (MSC) and install a Novak Tempest Max electronic speed control (ESC). Next, I removed the 380 motor and installed a Reedy\* Firehawk stock motor in its place.

Out went the stick pack and the raised battery mounts, and in went a Reedy Zapper RC2000 matched saddle pack. I used a Cirrus\* CS-90 high-speed steering servo because its unusual size seemed to be tailor-made for the SP3. A Hitec Lynx FM transmitter and HFS-04MI FM receiver completed the electronics package.

Next, it was time to upgrade the chassis. I replaced all the bushings with ball bearings and installed tie rods on the upper suspension arms and steering rods to make camber and toe adjustment much easier. I then smeared some Trinity Purple Stuff on the front coil springs to provide a little more front damping.

At the rear, I replaced the molded left and right hubs and diff hub with the optional purple Duraluminum pieces and installed the optional thrust-cone washer and ball bearings in the diff. This made the diff much smoother and more adjustable. I glued a set of soft-compound tires onto the rear hoops and replaced the in-line-mounted friction shock with a Trinity purple-anodized Delta shock (a nice oil-filled unit is available from MRC, but I installed what was in my toolbox). Forty-weight oil and the stock coil spring provided the right amount of damping and preload. To add more side-to-side damping, I filled the side dampers with diff grease. The SP3 was looking good and ready to do battle.

MRC has just released many high-performance graphite upgrades that are designed to take the SP3 to the next level of performance. Unfortunately, no prices or part numbers were available at press time, but you can expect to find a graphite chassis, upper and lower pod plates and a front-suspension brace at your local dealer. MRC has also released a machined-aluminum motor mount and a left axle carrier. The photo shows the SP3 in fully modified trim. As you can see, this car can be serious!



## BUILDING & SETUP TIPS

Although the SP3 arrives 90-percent assembled, there are a few things left to do, so I've prepared a few tips to help you get it running smoothly and trouble-free, right from the get-go.

■ For you younger beginners: soldering the on/off switch to the mechanical speed controller is one step you might want to leave to more experienced hands. The shop where you bought the kit should be able to help you; you could also ask an older racer or the shop teacher at your school for assistance.

■ Use contact cement to glue the tires to the wheels. Smear the glue over the inside of the tire, then slide the tire over the wheel. With a rag, quickly wipe off the excess glue that seeps out, and you're finished.

■ Check the diff to make sure that it's tight. Tighten the diff adjustment nut until it is nearly impossible to rotate the spur gear by hand.

■ Install your radio gear and adjust the throttle trim while the car is on a car stand. If your radio is not equipped with a throttle dual rate or end-point adjustment, you may have to mount the throttle arm in the alternate hole on the speed-control wiper arm, or the alternate hole on the servo horn, to obtain the proper amount of throw.

■ Smear grease onto the side dampers to firm up their action.

■ I highly recommend that you install a high-quality servo-saver. The stock yellow plastic unit worked well for a few runs, but it soon developed excess slop, and that made the steering impossible to trim out.

■ If you decide to run stick packs, you'll notice that the ball joint that's mounted on the motor pod for shock mounting is too long and will bind on the battery pack. I removed the excess thread with a rotary cut-off tool.

■ Install the 2mm ride-height adjusters under the front suspension-arm mounts. This will lower the front end to the correct ride height. The ride height on our test vehicle was pitched up toward the front.

■ Install two 2mm preload spacers on the center shock to provide the correct rear ride height.

## FINAL THOUGHTS

For the money, the SP3 is hard to beat. If you can convince a few friends to pick one up, you'll have fun cars for evenly matched pick-up races, or even an economical spec-racing class. Overall, I was pleased with how the car performed in both stock and modified trim, but I found the reversing MSC a bit of a nuisance because of its lack of brakes. However, it was very reliable and much smoother than most 3-step units. I recommend the MRC/Academy SP3 to any first-time R/C hobbyist who's looking for a fun, simple, on-road car.

\*Addresses are listed alphabetically in the Index of Manufacturers on page 209.



# 1999 READERS' CHOICE awards

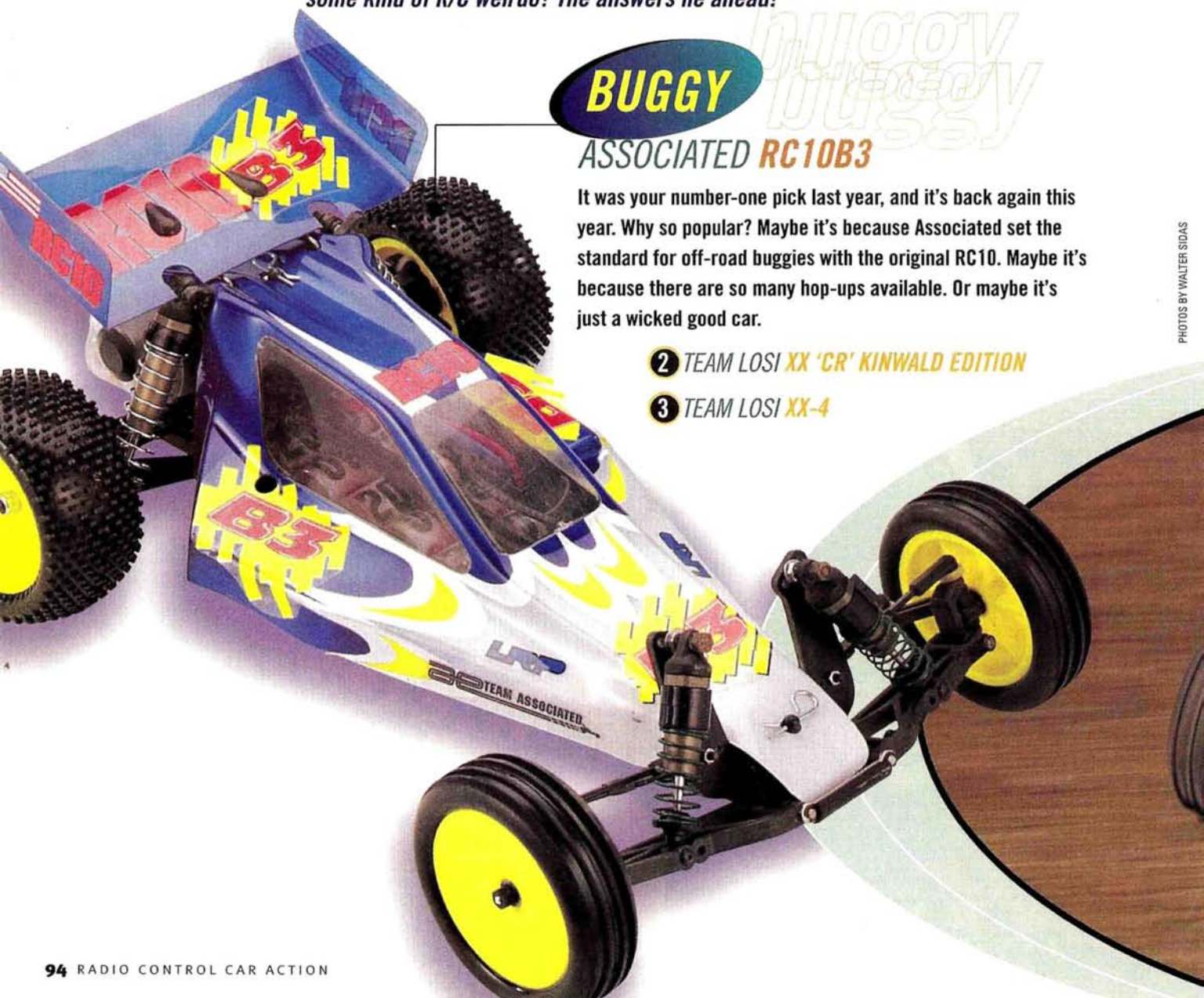
**I**t's that time again—time for the staff of Radio Control Car Action to do ... nothing. We don't put this article together; you do. It's your votes that make the Readers' Choice Awards happen. If you were to walk into a hobby shop right now with a blank birthday check, this is the gear most of you would get. There are some familiar winners here, some startling upsets and a few surprises. Do your choices match those of your fellow hobbyists, or are you some kind of R/C weirdo? The answers lie ahead!

## BUGGY

### ASSOCIATED RC10B3

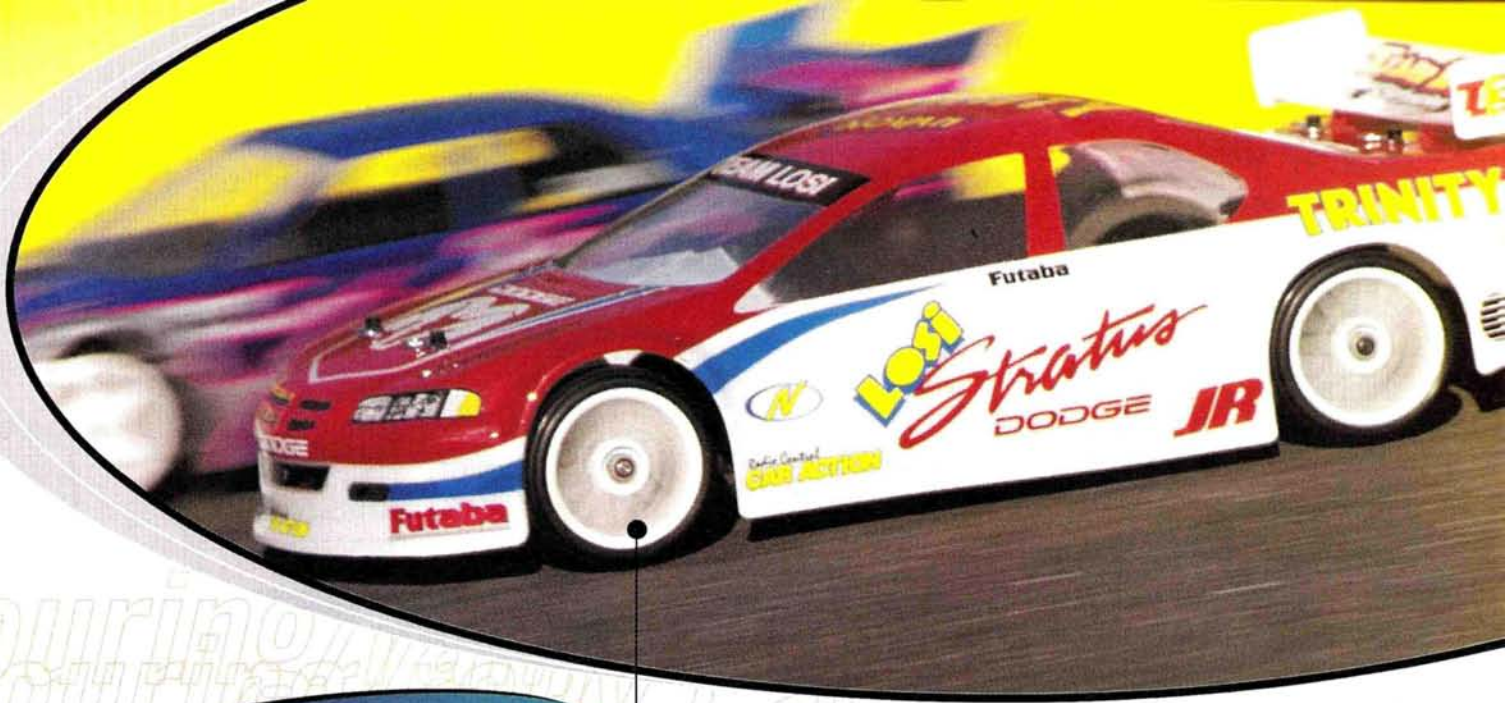
It was your number-one pick last year, and it's back again this year. Why so popular? Maybe it's because Associated set the standard for off-road buggies with the original RC10. Maybe it's because there are so many hop-ups available. Or maybe it's just a wicked good car.

- 2 TEAM LOSI XX 'CR' KINWALD EDITION
- 3 TEAM LOSI XX-4



PHOTOS BY WALTER SIDAS





## TOURING/RALLY CAR

### TEAM LOSI STREET WEAPON

Could the Street Weapon's winning ways at the Worlds have anything to do with your pick? Hey, it couldn't have hurt. Add growing aftermarket support for the Weapon and design refinements from the Losi engineers to the mix, and you have a winner.

- 2 HPI NITRO RS4
- 3 HPI RS4 PRO

## TRUCK

### ASSOCIATED RC10T3

The A-team repeats again! The T3 reeled in the votes as your top truck—not surprising, really, given your selection of the B3 as top buggy; the big-tire “B” machine now shares more parts than ever with its buggy brother, and it's the best handling truck ever to emerge from the A-team paddock.

- 2 TEAM LOSI XXT 'CR' GRAPHITE PLUS
- 3 HPI RS4 MT





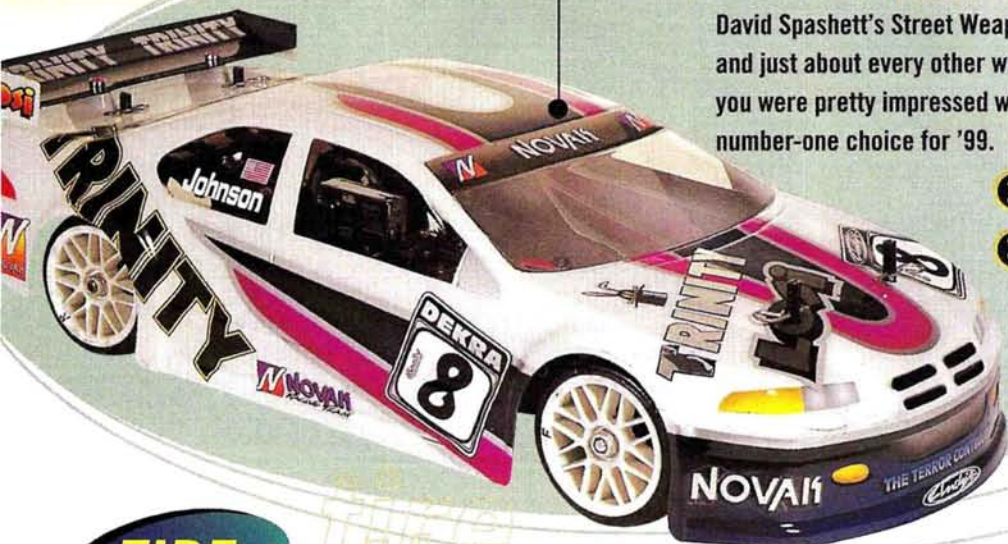
## BODY

### ANDY'S STRATUS

David Spashett's Street Weapon wore an Andy's Stratus shell to win the Worlds, and just about every other winning sedan racer has followed suit. Obviously, you were pretty impressed with the Stratus, too, since you did make it your number-one choice for '99.

2 PRO-LINE 1999 CHEVY STADIUM TRUCK

3 HPI DODGE RAM



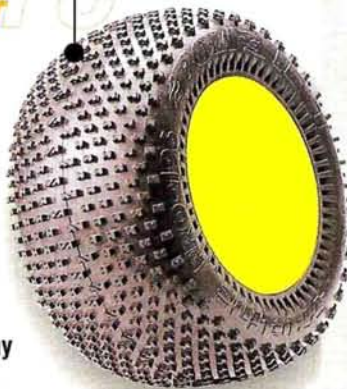
## TIRE

### PRO-LINE BOWTIE T

The versatile BowTie tread (which is now available for 1/8-scale buggies) tops the tire list this year, and the entire category is a Pro-Line sweep. That obviously says good things for Pro-Line, but it also speaks to the popularity of off-road R/C; touring cars may be the latest flavor, but dirt reigns supreme.

2 PRO-LINE DIRT HAWG

3 PRO-LINE HOLESHOT



## DRIVER

### BRIAN KINWALD

The Dirtinator. BK Broiler. The Great Kinwaldo. Call him what you will, but call him fast. After all, he is the reigning 2WD and 4WD off-road world champ! The Brian/Trinity/Losi combo has been successful since race one, and it's no surprise that Flyin' Brian is your man of the year.

2 MARK PAVIDIS

3 MASAMI HIROSAKA



## R/C INNOVATION

### TRINITY PARADOX

This category produced a slew of votes for the Paradox. Looks as if that "rebuildable" concept is a winner, eh? Easier to maintain, easier to tech and more economical to race with; that's a tough combo to beat, especially when the motor packs the same stock-class wallop as the Midnight 2 and includes all the trick advances pioneered by the popular fanged flier.

2 CVEC TUNED PIPE

3 HAMMAD GHUMAN VLT SHOCKS





## PAN CAR

### ASSOCIATED RC10L30

OK; now that you've picked Associated's first triple-shock oval effort as your numero uno pan pugilist, that makes it a clean sweep. Top buggy? Check. Top truck? Check. Top pan car? Check. The Associated crew took top honors in every class they produce vehicle for! Will the A-team sweep all four vehicle categories in Readers' Choice 2000? The only ones who know the answer to that question is ... you.

2 ASSOCIATED RC12L3

3 TRINITY SWITCHBLADE 10

## SPEED CONTROL

### NOVAK CYCLONE

The hobby's first truly programmable ESC remains the most adjustable controller available. The latest version features Polar Drive PCI (power capacitor internal—no more external capacitor to solder on), 13-percent lower on-resistance and a new feature called "Constant Force Braking" that ensures effective braking at any speed. Which is all a fancy way of saying the Cyclone will probably be your top pick again in 2000.

2 TEKIN 6-10

3 LRP IPC V6

## RADIO

### AIRTRONICS M8

Man, when you guys pick a favorite, you stick with it! The M8 returns to the number-one spot for a second year. Arguably the easiest to use super radio, the M8 has every racing feature you could ever need, as well as 10-model memory, packed into a comfy case.

2 FUTABA 3PJ

3 FUTABA 3PDF



## MOTOR

### TRINITY D3.5

Do Trinity's motor meisters ever sleep? Apparently not, as late '98 and 1999 have seen a spate of hot motors from the electric-power juggernaut. The D3.5 is the latest mod mill, and with its polarized brushes and springs, high-silver-content brazing, potent 6.2V magnets, "Monster Circular Mill" hemi winds and extra-thick mounting plate, there's a lot to like.

2 TRINITY PARADOX

3 TRINITY D3



## VOTES FROM

## BIZARRO LAND

A few of our readers made unusual choices, but a few were truly bizarre—and funny, which is why we're sharing them with you. Maybe you know (or are!) the one who voted for:

**TOURING/RALLY CAR:** Subaru. That's it; just Subaru.

**BUGGY:** Tamiya Rough Rider. Uh, it was a cool buggy ... in 1980.

**DRIVER:** Dale Earnhardt. Hint: if the driver must climb *inside* the vehicle to drive it, it ain't R/C.

**TIRE:** REM Striker. Micheal Stipe is making tires now? Take a break, driver eight.



**1999**  
**READERS' CHOICE**  
*awards*

## CHARGER

### TEKIN *BC 112C*

Tekin's popular plug-in-and-press-go charger returns to the top spot for '99. That's three years in a row! With 1- to 12-cell charging capability, an LCD screen that displays amp rate, charge time, charge capacity and voltage, and a built-in 10A power supply, the good ol' 112C has reason to be popular. Convenient, adjustable, and feature-packed, goldy box is found on the bench tops of serious enthusiasts and pit tables of racers everywhere.

2 *NOVAK MILLENNIUM*

3 *COMPETITION ELECTRONICS TURBO 30*



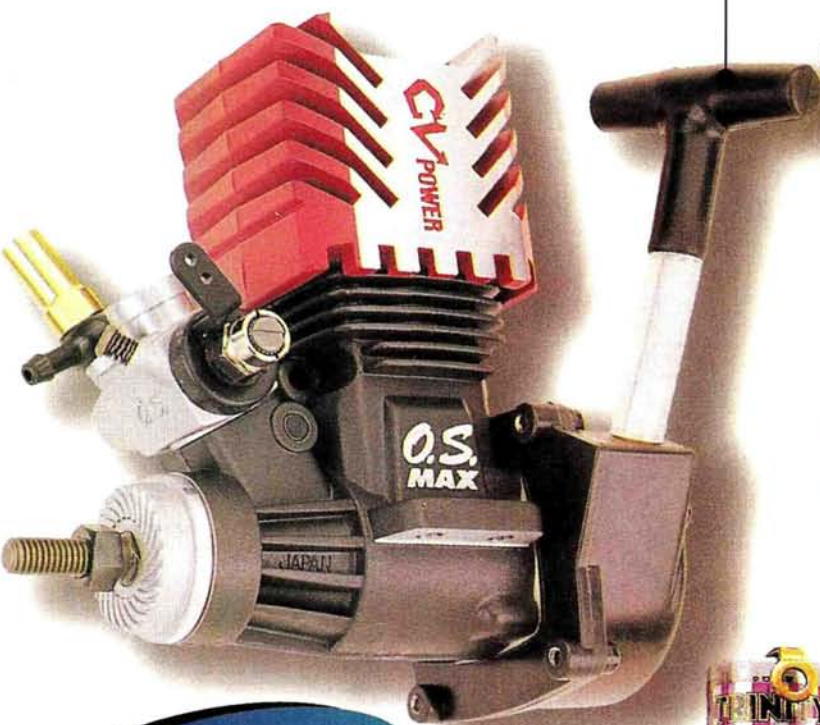
## ENGINE

### O.S. ENGINES *.12CV*

It seems you like your nitro cars in 1/10 scale, and when you want horsepower, you reach for O.S. engines. Given the company's long-standing rep for quality and reliability, we aren't surprised. Some voted for the CV-X with pull start; others penned praise for the bump-start version; but either way, the O.S. CV takes top honors—again.

2 *TOP/NOVAROSSO C-12*

3 *THUNDER TIGER PRO .21 BR*



## BATTERIES

### TRINITY *VIS EX-TRA TEAM EDITION*

Hey, what can you say about Trinity batteries? They won the 2WD and 4WD Off-Road Worlds. They won the On-Road Worlds—all three classes! Gee, do ya think they're any good? That Voltage Increasing System stuff must really work. It definitely did the trick for David Spashett.

2 *TEAM ORION V-MAX PLUS*

3 *REEDY ZAPPERS*

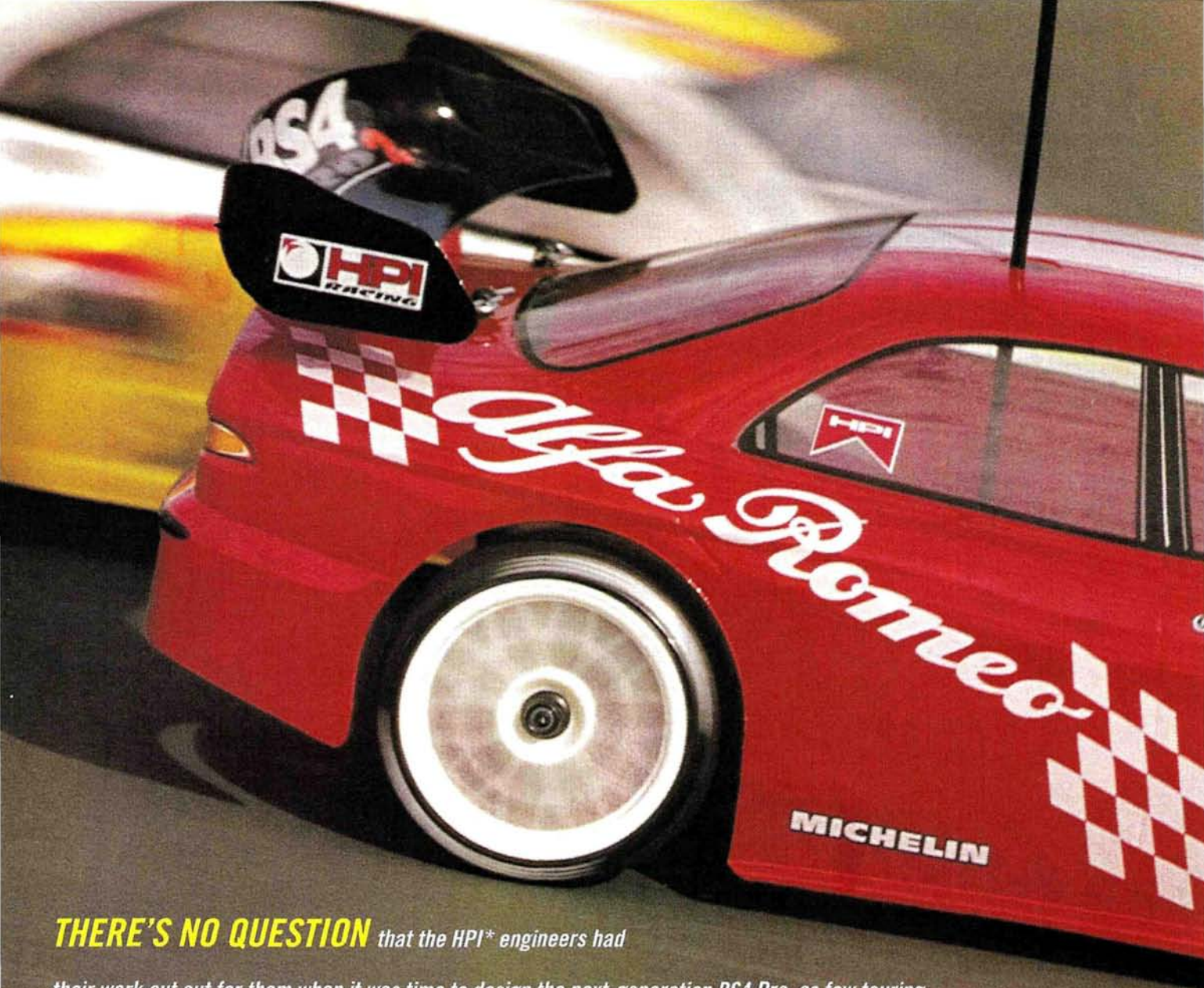


\*The addresses of the companies featured here are listed alphabetically in the Index of Manufacturers on page 209. ■









**THERE'S NO QUESTION** that the HPI\* engineers had their work cut out for them when it was time to design the next-generation RS4 Pro, as few touring cars have been as well received by both racers and enthusiasts. HPI must have been tempted to leave well enough alone! But despite the RS4 Pro's success and popularity, HPI's designers knew they had to revisit it to

# HPI RS4 PRO 2

by George M. Gonzalez

# TEST-DRIVE THE



## SPECIFICATIONS

SCALE 1/10  
LIST PRICE \$399

**DIMENSIONS**  
Wheelbase 9.88 in. (251mm)  
Width (F/R) 7.2/7.4 in. (183/188mm)

**WEIGHT**  
Gross, RTR 50 oz. (1,417.5g)

**CHASSIS**  
Type Double-deck plate  
Material Graphite

**DRIVE TRAIN**  
Type Dual belt  
Primary Pinion/spur  
Drive shafts MIP CVDs  
Differential(s) Ball  
Slipper clutch None  
Bearings/bushings Bearings

**SUSPENSION (F/R)**  
Type Lower A-arm/upper wishbone  
Damping Aluminum, oil-filled coil-over shocks

**WHEELS**  
Type HPI mesh pattern  
Dimensions (DxW) 2x1 in. (50.8x25.4mm)

**TIRES**  
Front/rear HPI belted slicks

**ELECTRICS** (not included)  
Motor Orion Super Touring  
Battery Orion Vmax Plus  
ESC LRP IPC V6



keep pace with the  
surging touring-car scene. With input from racers  
from around the world via the HPI website ([www.hpiracing.com](http://www.hpiracing.com)), the  
RS4 Pro 2 became a reality. This in-depth look is the next best thing to  
holding the car in your hands; turn the page, and take the wheel.

# NEW 2





## A few words with designer Akira Kogawa

Akira Kogawa has been designing cars for HPI for over eight years and designed the RS4. Before joining HPI, Akira worked for a firm in Japan that designed R/C cars for Kyosho. The Kyosho Blizzard was Akira's first design, but he can also take credit for the Kyosho Tomahawk, Optima, Optima Mid, Ultima, Burns, Plasma and the Phantom 4WD 1/12-scale cars, just to name a few. I met with Akira at HPI USA's Southern California headquarters to talk about the Pro 2. Here's what he had to say.

### Radio Control Car Action: In your opinion, what are the most important improvements in the Pro 2's design?

AK: The car's "balance" or weight distribution. The Pro 2 has nearly perfect side-to-side balance. It is easier to drive because weight is transferred more efficiently. Drive-train efficiency is also a very important improvement; the new drive belts are more efficient, and that makes the car run faster and longer. Also, the rear axles are now perpendicular to the chassis's centerline, and the included MIP CVDs are lighter; this also contributes to the car's increased efficiency.

### RCCA: I understand that many of the Pro 2's features are the result of racer feedback from the HPI website. How much actual influence did the website have on the design, and what was HPI Japan's contribution to the Pro 2?

AK: The Pro 2's design was a group effort between HPI USA and Japan. The Japanese touring-car market is very large, so naturally, the Japanese racers are the toughest critics to please. For this reason, we listened very hard to advice that HPI Japan provided. Hidekazu Ito, who is one of the designers here in the USA and a very good driver, drew up the original plans. Because of his racing nature, he wanted a car that offered maximum performance. The rest of the car's design came about as a result of many ideas from many people—far too many to mention. The website also helped us to fine-tune the finished product.

### RCCA: The Pro 2 has already influenced the design of the company's new Nitro RS4 RTR and Super Nitro RS4; will we see more cars that are based on the Pro 2? How about an RS4 Sport 2?

AK: I think I could say "Yes" to the first part of the question. As far as an RS4 Sport 2, well, that depends on what the customer wants. Most people who buy "sport" cars want a body and decals to be included with the kit and probably will use stick-pack batteries. The RS4 Sport works very well and is a good seller, so it's very difficult to say that we'll be releasing a Sport 2 anytime soon. We did talk about the possibility of a Sport 2 early on in the design process, though.

### RCCA: Who came up with the idea to include all the cool purple-anodized hardware? HPI USA or HPI Japan?

AK: Everyone wanted anodized hardware!

## IN-DEPTH LOOK

### 1 Longer chassis plate and redesigned upper deck

You may recall that the RS4 Pro's rear suspension arms were swept rearwards, and that's how it achieved its legal IFMAR touring-car wheelbase. The Pro 2's lower chassis plate is 8mm longer, which permits the use of straighter, non-swept rear suspension arms. As a result, the included MIP aluminum CVDs spin at much less of an angle, and this in turn provides a smoother power transfer. The lower chassis plate is also slightly wider toward the front to provide more room for the electronics. The new upper deck is slightly smaller to make battery mounting a little easier. It also holds the bellcrank steering system and provides ample space for the receiver and a redesigned antenna mount that can be mounted in several locations. A molded-carbon-fiber center chassis brace replaces the aluminum posts found on the previous car. It's stronger and supports both the upper and lower chassis plates as well as the motor mount and front belt tensioner.

Chassis flex can be adjusted by installing optional chassis posts. In most cases, these posts will not be necessary. Installing a single post will reduce chassis flex slightly and may improve the car's steering response on high-bite tracks. For racing on carpet tracks, installing a second post will eliminate most of the flexing.

### 2 Strap-in battery mounting

The new saddle-pack battery-mounting system is one of the most user-friendly I've tested. The cells are mounted on a molded plastic tray that in turn is keyed to the battery slots that are cut in the chassis. The cells are mounted as low as possible to keep the car's CG low, while the plastic tray provides a non-conductive mounting surface for the cells. Purple hook-and-loop straps hold the cells in place and are easy to secure and release. The kit also includes a stick-pack battery-mounting system for those who prefer to use the conventional configuration.

### 3 Molded-carbon-fiber rear shock tower

The new molded rear shock tower is stronger, more rigid and secured with four screws instead of two; its design allows easier rear swaybar installation.

### 4 Transponder mount

The adjustable, molded-carbon-fiber transponder mount can be mounted in several ways to accommodate the electronics.

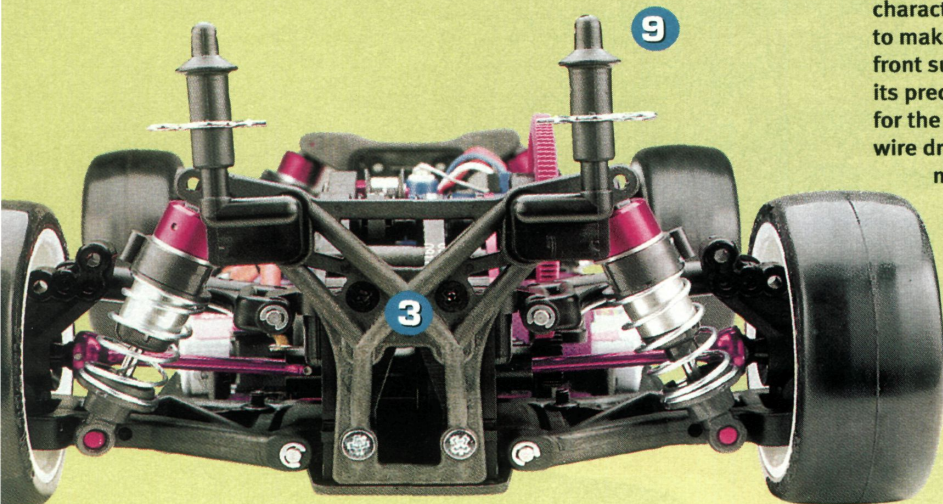
### 5 New suspension geometry

The Pro 2 features upper and lower suspension arms; this is a departure from the lower-arm/upper camber-link system that was used on the Pro. It also features stronger lower suspension arms, a molded-carbon-fiber shock tower and redesigned caster blocks. Two sets of caster blocks (8 and 10 degrees) greatly help with tuning, and two upper arm mounts (0 and 4 degrees) allow you to add dive or anti-dive characteristics to the front suspension. Of course, tie rods are included to make camber and toe adjustment much easier. In short, the Pro 2's front suspension is more "tunable" and is stronger and more rigid than its predecessor's. Redesigned bellcranks have three mounting choices for the center link, and a tie-rod drag link replaces the previous piano-wire drag link. In addition, the bellcranks are held from above with aluminum posts that are secured to the upper deck.

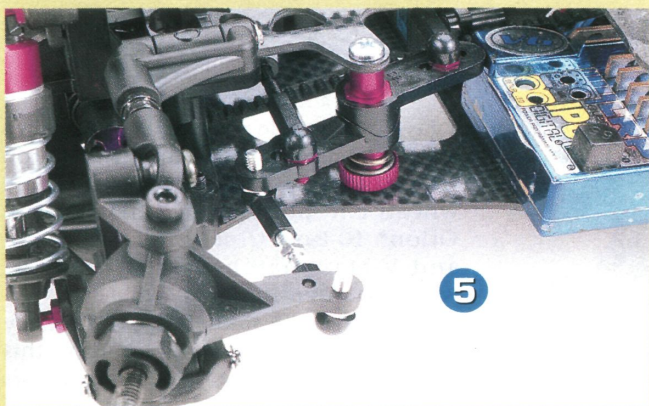
In the rear, 1-degree and 2-degree rear hub carriers are supplied for toe adjustment.

### 6 Improved dual-belt drive

The RS4 Pro's dual-belt drive train with silky-smooth front and rear ball diffs has been carried over to the Pro 2. The front and rear drive belts, however, are made from a new, more efficient material, and the front drive belt is longer to accommodate the lengthened chassis. In addition, a new spur-gear mount places







*The Pro 2's steering system is an improved version of the Pro's. An adjustable tie rod replaces the piano-wire drag link, and the bellcranks have three center-link mounting holes that allow steering Ackerman adjustment. The bellcranks are now held from above, and the adjustable servo-saver has been retained.*

the spur gear closer to the motor mount to broaden the range of pinion gears that can be used. The Pro 2 carries over its predecessor's rear-mounted front belt tensioner, and it also has a new ball-bearing-equipped tensioner built into the front bulkhead.

## 7 Super Shocks

You'll find HPI's self-bleeding Super Shocks on the Pro 2; they rank among the smoothest shocks available, in my opinion. The shocks' new, clear O-rings work with less friction than the previous orange O-rings, and soft silver springs and a complete set of precision shock pistons help with tuning.

## 8 Purple everywhere!

The Pro 2 is graced with an abundance of purple-anodized aluminum hardware. The motor mount, hinge-pin supports, shock caps, belt-tensioner pilot shaft, bellcrank posts and servo-saver adjustment knob are all purple-anodized. Heck, even the MIP aluminum CVDs and the steering-servo tie rod are purple-anodized. The kit also includes a complete set of lightweight aluminum ball joints, and yes, most of those are purple-anodized, too.

## 9 Telescoping body mounts

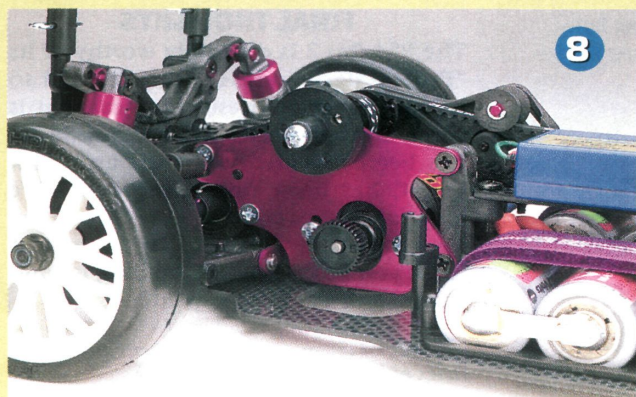
The telescoping body mounts can be adjusted to fit several bodies without your having to change the body posts.

## 10 Next-generation racing rubber

The Pro 2 includes a complete set of HPI's new 26mm Belted Super Slicks and medium-compound foam inserts. These are great tires, and they seem to hook up just about anywhere. The kit also includes HPI's new white mesh wheels, which look good and are great performers.

## 11 Included foam bumper

..for when you go boom.



*The new saddle-pack battery-mounting system is ingenious. A ball-bearing-equipped, molded-carbon-fiber side plate/front belt tensioner is standard. Check out the adjustable transponder mount!*



## Building the Beast

My early production Pro 2 had some teething pains; most notably, the suspension arms were a tight fit on the hinge pins until the hinge pins' paths had been enlarged with a 3mm drill bit as prescribed by an update sheet included with the kit. The update sheet also notes the need to remove one of the belt tensioner's screws and move the tensioner aside to gain access to one of the upper deck screws. My kit required this, but by the time assistant editor Greg Vogel received a Pro 2 (a week after mine arrived), the problem had been fixed (Greg's car is featured in the photos; note the relief in the belt-tensioner support). HPI assures us that the hinge-pin problem has also been addressed and claims that by the time you receive this issue, there won't be any Pro 2s out there with improperly sized hinge-pin holes (unless your dealer has been sitting on a first-run kit, but given the way Pro 2s are moving, that's highly unlikely).



# THE FAMILY TREE

## THE ORIGINAL RS4

The original RS4, released in the latter half of 1995, was a milestone because it was one of the first single-purpose 4WD touring cars available in the States.

The car featured a double-deck fiberglass chassis and was designed for stick-pack use only. A ball diff- and slipper clutch-equipped 3-gear sealed transmission (that looked as if it was designed for off-road use) was mounted on the rear of the chassis and the power was fed to a front ball diff via a long, single drive belt. The RS4 included universal drive shafts with adjustable widths that provided the final drive and a fully independent front and rear suspension with upper and lower suspension arms. The RS4 was also the only touring car that could be built as a 190mm or 200mm car without requiring extra parts.

## THE RS4 PRO

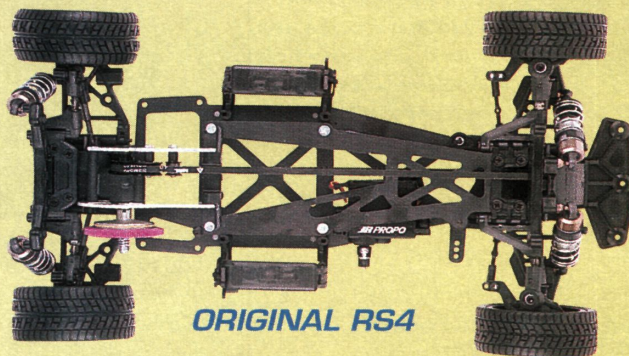
The original RS4 Pro was released in the early part of 1997 and was the result of two years' research and development and a wealth of racer input. The RS4 Pro gave racers what they were looking for: graphite chassis components, ball bearings, saddle-pack battery mounting, a dual-belt drive system with front and rear ball diffs and super-narrow tires.

The Pro also boasted a completely new front suspension that was designed to provide more on-power steering, and it included front and rear graphite shock towers to boot. HPI did away with the upper suspension arms and incorporated upper camber links instead. The upper camber links worked great, but they took away the adjustable caster, and some racers felt that was a drawback.

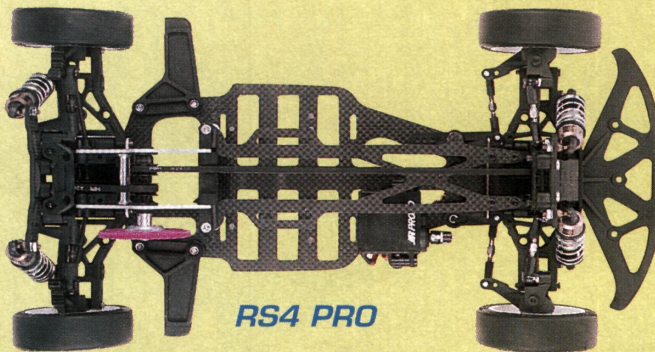
## THE RS4 SPORT

HPI soon released an entry-level version of the RS4 Pro, appropriately called the RS4 Sport, that is still available. The Sport includes the original RS4's fiberglass chassis that was designed for stick packs only, molded shock towers instead of woven graphite, plastic versions of HPI's aluminum-body Super Shocks, bushings instead of bearings and dogbones instead of universals all keep the kit as affordable as possible.

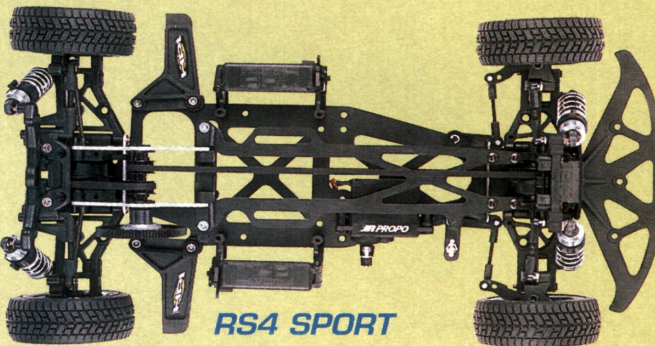
Many of HPI's current kits are direct spinoffs from the RS4 Sport; these include the Mini RS4, the RS4 Rally and the RS4 MT stadium truck. However, the RS4 Pro 2 is influencing HPI's latest kits,



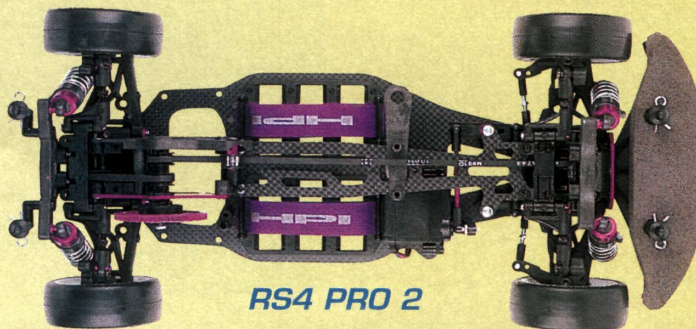
ORIGINAL RS4



RS4 PRO



RS4 SPORT



RS4 PRO 2

including the Nitro RS4 RTR and the Super Nitro RS4; these feature very similar front suspensions and many other interchangeable parts.

## RS4 PRO 2

Since the rest of this entire article is devoted to this bad boy, we won't get too deep here! Check out the rear arms, which no longer need to sweep back to extend the car's wheelbase. The chassis is less relieved, and the upper deck is the smallest yet. Overall, the car looks leaner and meaner, and a blast from the past tops it off: dig the front upper wishbones that are reminiscent of the original RS4's.

## PERFORMANCE

I gave our sample vehicle its shakedown run at So Cal Raceway in Huntington Beach, CA. With the stock tires and wheels and powered by a nasty Team Orion\* 10-turn triple modified motor and V-Max matched cells, the ride would be interesting, indeed.

As always, the staff at So Cal Raceway set up a challenging course, and on this particular evening, the layout was extremely technical. Unfortunately, I wasn't able to lay down the ponies, but I was able to test the car's cornering. There wasn't a corner sharp enough to make me want to increase the steering dual rate on my radio, which was almost dialed to the minimum; the rear end was manageable even when I exited the corners under power.

Back in the pits, I grew fond of the Pro 2's battery-mounting system; it was a pleasure to leave the strapping tape in my toolbox. I also appreciated the Pro 2's new spur-gear mount because I was able to use standard-size pinion gears (the previous RS4 Pro required long-shank pinion gears).

The next stop was California R/C Center in Anaheim where I was able to test the car's high-speed handling and its efficiency. If you're not geared to the moon at Cal R/C, you're left in a cloud of tire dust because of the giant straight-away and speed-hungry sweeper! After making only two adjustments to the car—saucing the tires with Paragon\* Ground FX and gearing up a couple of teeth—I sent the car down the straight-away. Once again, I was impressed with its steering, and I had no problem making run time, but this time, it felt just a tad loose.

To get the car glued to the track, I only needed to switch to a slightly lighter shock fluid in the rear dampers. From that point on, it moved faster and faster as I became familiar with it—and the track. I was very impressed with the stock tires because they worked equally well at both tracks, and I was just as impressed with the Pro 2's performance, both on the track and in the pits.

## FINAL THOUGHTS

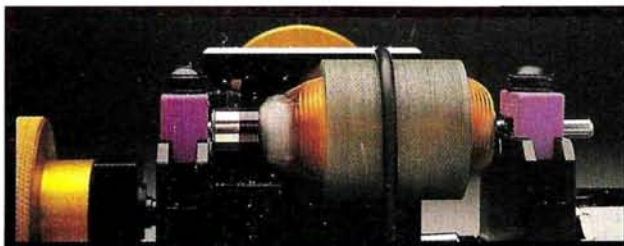
The RS4 Pro 2 is definitely worthy of its "Pro" designation. HPI has listened to its customers and designed a car that is based on their wants and needs. The car has been repeatedly refined and, as a result, has been vastly improved. We look forward to continued testing of the new HPI RS4 Pro 2 and plan to revisit it to let you know how it's holding up and to pass along some setup advice.

\*Addresses are listed alphabetically in the Index of Manufacturers on page 209. ■









# MOTOR

## SIX WAYS TO

**M**any of the motors we use in R/C cars have the designation "05." This number indicates that, in its intended configuration, the motor will develop about 0.05 horsepower at 1.5 volts. In R/C applications, however, the motors are subjected to upwards of 10 volts with 6-cell battery packs, and current loads may be as high as 150 amps! A good stock-class motor develops around 0.2hp, while the hotter modifieds are capable of well over 0.3hp. When all this is taken into consideration, it's obvious that the motors will wear a little faster than they were intended to.

The advent of stock motors with removable end-bells—technology ushered in by Trinity's Paradox motor—has introduced motor rebuilding to a new class of racers and R/C hobbyists. Stock-class enthusiasts have the advantage of stock-motor lathes, but these lathes aren't nearly as capable of cutting the precision finish on the commutator as the lathes designed for modified motors.

A motor can be run as many as 20 times before there is a substantial loss of performance caused by brush and commutator-surface wear. The brushes are easy enough to replace; the comm poses more of a problem, but it can be reconditioned: the armature may now be removed from both stock and modified motors; it can then be placed on a comm lathe and the surface of its comm precisely cut (reconditioned).

A precision-cut comm and a fresh set of brushes will at least restore a motor's performance and might even improve it! Even the most expensive comm lathe will soon pay for itself by extending your motor's life.

Here, we feature the most readily available comm lathes. By traditional standards, they're all considered to be "modified" motor lathes, but the introduction of the rebuildable stock motor has made them more universal. Before you rush out to buy a comm lathe, check out the features of those listed here and decide which would best suit you.



**C&M MFG./  
TEAM COBRA  
2000L Pro**

C&M Team Cobra\* is known for its motor lathes; in fact, Cobra offers a more comprehensive line of lathes than any other manufacturer. The 2000L Pro shown here represents the middle of the Cobra line in terms of features and price. It's the same as the 2000 Pro but has the bonus of a power base that houses the batteries and the on/off switch. At the top of Cobra's line is the 2000Q Motor Builder's Lathe; it features 50-percent-wider ways for increased stability and hardened-chromoly tool-steel guides

### ELITE Commutator Lathe



The Elite\* commutator lathe is the lightest and most compact in our group—great for those who wish to minimize the weight of their pit boxes—and it comes with a foam-padded canvas carrying case. All parts except the armature guide plates are constructed of red-anodized aluminum. The plates feature ball-bearing guides, and the distance between the plates may be adjusted to accommodate a variety of armatures (just



# LATHE GUIDE

COMM DOWN

by Steve Pond



## EAGLE RACING *Modified Commu-Lathe II*

Eagle's\* Modified Commu-Lathe II features all-aluminum construction. The guide plates have ball bearings and may be adjusted to accommodate the width and diameter of an armature. They also have angled U-grooves that keep the armature in place while the comm is being cut. Steel rods between the guide plates keep them aligned. The Commu-Lathe II does not come with any tools, but it does include a prewired motor switch with a Tamiya-style connector, a drive O-ring and motor screws.



loosen a screw under the left guide, and move the plates to where you want them). Alignment rods pass horizontally through both plates to keep them aligned.

## HOW MUCH DIFFERENCE DOES IT MAKE?

**S**o you're considering buying a motor lathe, but you aren't really sure how much of a performance benefit it offers. We visited Extreme R/C (Enfield, CT), a local hobby shop and racetrack, to borrow a racer's motor—one with a little wear and tear.

We came home with a Trinity D3.5 12x2 that had been run about seven times; it was still in pretty good condition, but had been given virtually no maintenance. When we inspected the armature, we saw carbon deposits at the comm slots—a condition that shows it's time to rebuild. The armature and the commutator were otherwise in very good condition.

Using the Robitronic\* dyno, we tested the motor as it had been handed to us, then we rebuilt it using the Hudy Pro Lathe. We chose this lathe because it has a diamond cutting bit that ensures the most precise comm cut. Following basic motor-rebuilding principles, we cleaned the D3.5, oiled the bearings and gave it a new pair of brushes. Then we hooked it up to a 2-cell pack for a 10-minute break-in.

After that, we tested the reconditioned motor on the same dyno to determine how much, if any, performance gain a freshly cut comm (as part of a rebuild) would give.

The dyno readout was amazing. The motor's maximum power had increased from 198.7 to 234.4 watts—an 18 percent increase! Its torque rating at maximum power increased by 4 percent; efficiency went up by 6 percent; and the resistance through the brushes and armature dropped by almost 32 percent!

This is clear and convincing evidence that used correctly, a good comm lathe, in addition to extending a motor's life, will maintain or even improve its performance.



## Rebuild it right!

There aren't any deep dark secrets to cutting a comm—just a few sound practices that will ensure the best cut and, ultimately, the best performance. The following steps include suggestions from some of the best motor builders in the country. They tried many methods and decided that these are the best for getting optimum results from your motor lathe.

- Start disassembling the motor by removing the brushes and brush springs. Having done that, use a hobby knife to mark the stock timing setting (for modified motors) on the endbell and the can. Loosen the endbell mounting screws and rotate the endbell until you can remove the timing ring from the can (with rebuildable stock motors, you may have to completely remove the endbell mounting screws). When removing the endbell, be careful because the motor shims on the shaft (above the commutator) may come off and fall to the ground.

- With the endbell removed, turn the motor over and remove the armature from the can; the magnets will offer some resistance, so you'll need to get a good grip on the motor shaft. Again, be very careful here to avoid losing the shims that are on the bottom of the armature shaft; be sure that none of them fall out.

- Before putting the can and the endbell aside, check the bearings or bushing for shims that may be sticking to them. Put these shims and any shims you removed from the motor onto your workbench in the same order as you removed them. This will make reassembly go much more smoothly.

- Put the armature in between the motor-lathe guides, and check that it fits properly. If your lathe has fixed guides, you'll need to add shims to ensure proper clearance. With fixed or adjustable guides, the armature should fit snugly enough to prevent it from sliding back and forth, yet loosely enough to spin freely with just a little resistance. It's a delicate balance, but the proper setting is very important to obtaining a smooth cut.

- Most lathe instructions say the lathe should be powered with a 4-cell battery pack or any other 5V power source. I prefer to use a 3-cell pack to run the lathe slowly. At higher speeds, the potential imbalance of the rotating components is amplified. Don't, however, use fewer than 3 cells, as the lathe will turn too slowly to ensure a good comm cut.

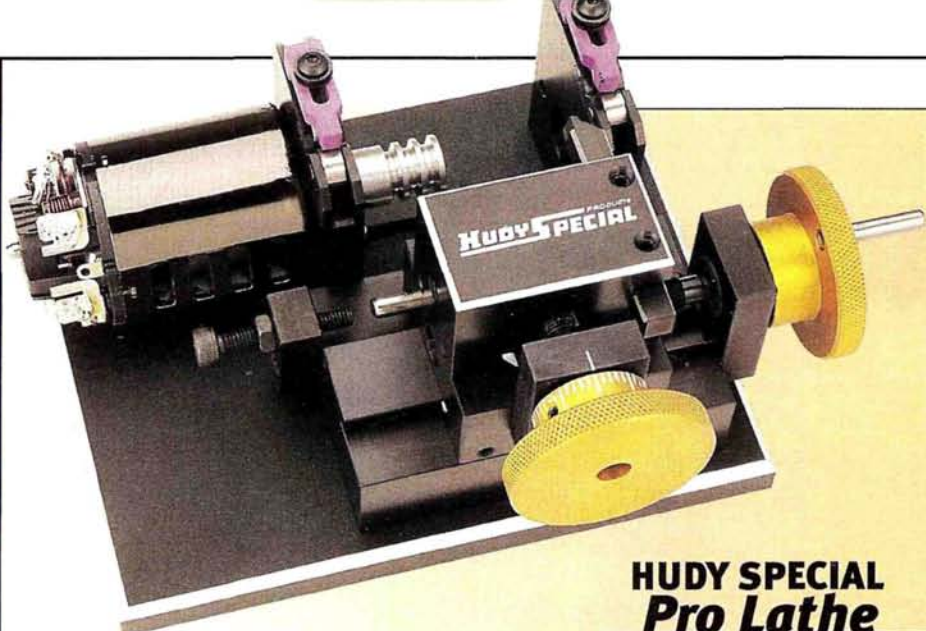
- With the armature and the drive O-ring properly positioned, put a drop of bearing oil where the motor shaft contacts the guides and the sides of the guide plates. Bearing-equipped guides don't require shaft lubricant, but a drop on the end plates where the armature bushings contact them will help.

- Turn the lathe on. Looking down on the armature, verify that it's spinning away from the downward-facing cutting bit. Before attempting the first cut, color the commutator with a black permanent marker. This will guide you when you start to cut and help you determine how deep to cut.

- Feed the cutting bit toward the top end of the comm. As the bit approaches the comm, feed it very slowly and stop as soon as it touches the comm. As you cut, you'll see a bright, copper-colored stripe in the black ink, so you'll know the bit has made contact with the commutator.

- Now feed the bit across the commutator toward the top end using the lead screw. Once the bit is completely off the end of the commutator, feed it toward the comm using the cross-slide screw. This adjustment should be only about half a notch closer to the comm so that the cut is only slightly deeper than the first partial cut.

- Feed the bit across the length of the comm, being sure to



## HUDY SPECIAL Pro Lathe



This Hudy\* Special lathe is the sharpest-looking lathe available. It features high-quality materials, precision machining and black-anodized coating etched with the manufacturer's name. Gold-anodized adjusting wheels round out the package. Two versions of the Pro Lathe are available: the Pro 1001 with ball-bearing guides and the Pro 1002 with hardened-steel V-guides. A pair of hold-downs keep a spinning armature in place and damp vibration. The lathe's standard, diamond cutting bit has a small radius at each corner for a glass-smooth cut, but it results in a higher price tag.

The lathe has its own molded-plastic carrying case that protects it when it's being transported to and from the track.

## TRINITY Tru-Lathe

With the exception of the guide plates, all the parts on the Trinity\* Tru-Lathe feature all-aluminum construction. The guide plate on the commutator side has a retainer/vibration damper, and it has been relieved to protect the cutting tool. Although the distance between the guide plates is fixed, they are pinned to the base (as is the bed) to ensure perfect alignment. The Tru-Lathe is also the only one of the group that allows extensive adjustment of the

### PRODUCT COMPARISONS

	COBRA	ELITE
Base	Aluminum	Aluminum
Bed	Aluminum	Aluminum
Saddle	Aluminum	Aluminum
Cross slide	Aluminum	Aluminum
Slide bushings	Teflon	Fiberglass
Lead/cross slide screw bushings	Aluminum	Plastic
Cutting tool	Carbide	Carbide
Guide	Aluminum	Aluminum
Guide type	U-groove	Bearing
Adjustable guides	No	Yes
Motor included	Yes	No
On/off switch	No	No
Thumbwheel diameter	41.5mm	37mm
Max. armature length*	46.3mm	53.2mm (adj.)
Max. armature diam. (approx.)	38mm	47.5mm
Max. armature-shaft diam. (approx.)	0.125 in. (3.17mm)	0.125 in. (3.17mm)
Drive motor rotation	Standard	Standard
List price	\$199.95 (\$169.95**)	\$160

\*Not including shaft. \*\*Without power base.

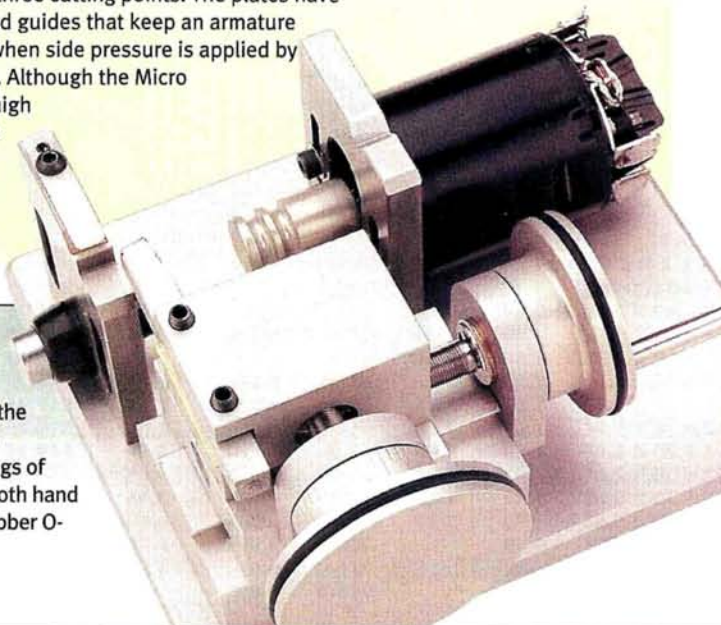




## REEDY MODIFIEDS/ TEAM ASSOCIATED Micro Lathe

The Reedy\* Micro Lathe is a real workhorse. All parts except the base and hand wheels feature all-steel construction. Its other unique features include a bearing-supported cross-slide and lead screws, large (50mm) hand wheels that allow more precise adjustments, durable brass slide bushings and a standard carbide cutter that has three cutting points. The plates have angled U-shaped guides that keep an armature firmly in place when side pressure is applied by the cutting tool. Although the Micro Lathe is at the high end of the price chart, it's the most ruggedly constructed.

drive motor to vary the O-ring tension or to accommodate O-rings of varied diameters. Both hand wheels feature a rubber O-ring as a grip.



HUDDY SPECIAL	REEDY	TRINITY	EAGLE RACING
Aluminum	Aluminum	Aluminum	Aluminum
Aluminum	Steel	Aluminum	Aluminum
Aluminum	Steel	Aluminum	Aluminum
Aluminum	Steel	Aluminum	Aluminum
Teflon	Brass	Fiberglass	Graphite
Steel	Bearings	Brass	Plastic
Diamond	Carbide	Carbide	Carbide
Steel	Steel	Aluminum	Aluminum
Bearing	U-groove	V-groove	Bearing/V-groove
Yes	No	Yes	Yes
No	Yes	No	No
No	Yes	Yes	Yes
36mm	50mm	43mm/37mm	37mm
50mm (adj.)	46mm	45.9mm	54mm
37mm	34mm	42mm	44mm
0.177 in. (4.5mm)	0.125 in. (3.17mm)	0.215 in. (5.45mm)	0.125 in. (3.17mm)
Reverse	Reverse	Standard	Standard
\$265 (w/diamond bit)	\$204	\$225	\$129.99

stop before you reach the wire tabs. When you rotate the lead screw, use a very slow, consistent motion, making a full rotation every two seconds. The line where the factory stopped cutting the comm is usually a good place to stop. If you feed the bit too far and it cuts into thicker material or into the wire tabs, you'll destroy it. This is especially true of fragile diamond bits. They are very easily chipped and cost up to \$100 to replace—so be careful!

- Feed the bit back across the surface of the comm using the same deliberate lead-screw motion. Once the bit reaches the end of the comm, stop the lathe and inspect the comm to see whether you've done enough cutting. Black ink on the comm's surface indicates a low spot that will require an additional pass or two.

- As long as you didn't move the lead screw, it should be at the same depth as it was for the first cut. If you need to do any additional cutting, adjust the bit toward the comm by half a notch. Instead of using ink this time, use a little bearing oil or comm-cutting oil to lubricate the comm. Cut the comm until you've removed all the black ink from its surface, then remove the armature from the lathe.

- Using the dull edge of a hobby knife, clean the debris out of the comm slots, then spray the comm, the motor can and the endbell with motor spray. Pay special attention to the bearings, as they may have picked up some debris of their own.

- Put a drop of bearing oil into each of the bearings (or bushing oil, for a stock motor), then slide the armature into the motor can before reinstalling any shims. Installing the armature without shims allows you to check that it's properly centered in the magnetic field. Place the endbell over the top of the can and hold it in place with a finger. While holding the motor horizontally, spin the armature by temporarily installing a pinion gear. Spinning the armature allows it to work its way to the center of the magnetic field.

- When the armature stops spinning, pull on the pinion gear to determine how many shims you'll need between the bottom of the armature and the bearing in the can. Remove the armature from the can and install one shim (I'm assuming more than one originally), and spin the armature again. Keep adding shims until the space between the bottom of the armature and the bearing is minute. If there is no movement when you pull on the pinion gear, you have too many shims and have to remove one or more.

- To establish the clearance at the top of the top of the armature, follow the same procedure, only this time, you should push on the pinion gear to force the armature toward the endbell. Hold the endbell firmly in place with a finger or two, and put shims over the top of the shaft until you've reduced the clearance to a minimum. Finally, install the endbell and check the armature clearance one last time. Assuming there's still a little clearance, re-set the motor's timing correctly by aligning the marks you made on the endbell and the can before you disassembled the motor.

- Now it's time for break-in. Put one drop of comm oil onto the comm and rotate the motor shaft a couple of times to distribute it evenly. Place the motor in a stand and, if possible, cool it with a fan during break-in. Many racers choose to use 4.8 volts (4-cell pack) for break-in. This high voltage certainly speeds up break-in, but I feel it's easier on the motor and on new brushes to run the on approximately 2.4 volts (2 cells). Let the motor run for about 10 minutes for proper break-in.

Voilà! Your motor is ready to run. I followed this procedure to rebuild the motor described in the "How much difference does it make?" sidebar. Read it to discover how much the motor's power, resistance, efficiency and torque were improved.

\*Addresses are listed alphabetically in the Index of Manufacturers on page 209.



## Mugen Prime 12 Hop-Ups

Mugen Seiki USA announced it will soon release new powerplant options and several alloy chassis and suspension components for the company's Prime 12 nitro-powered 1/10-scale touring car. The new VX 12 is a .12-size nitro engine that features a hardened nickel sleeve for performance and reliability and a machined heat-sink head with large cooling fins. Rotary- and slide-carb versions will be offered with or without pull-start, and the heat-sink head will be available in purple, green and blue.

Mugen also plans to release alloy front and rear suspension arms, front and rear uprights, steering knuckle arms and a spur-gear mount. Alloy flywheels and engine mounts are also available for both pull- and non-pull-start engines. Mugen reports all the parts will be reasonably priced.

### GET UP TO SPEED WITH ...

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## New Novak Cyclone Update

Novak Electronics will soon offer an updated version of its top-of-the-line Cyclone ESC that will include several new features and updated software. The popular speedo will also have a new faceplate that reflects the latest Cyclone design. In addition, the company plans to release an all-new Cyclone that's designed for touring-car racing. This special ESC will include the secret profile with the parameters that were used by the Team Novak touring car drivers at the '98 On-Road Worlds.

## Keyence A-01 ESC now available in U.S.

Keyence is well-known in Japan as a highly respected miniature electronics manufacturer. The company's ultra-small and feature-packed A-01 electronic speed controls have been used to capture major Japanese championships and are now available in the States. Ultimate Hobbies in Orange, CA, will import and distribute the Keyence line and will act as customer-support liaison for the manufacturer.

The A-01 weighs a mere 15 grams (without the three power wires installed) and takes up very little space on the chassis. Don't let its small size fool you, however; Keyence claims the tiny ESC can handle motors down to 7 turns and has an extremely low on-power resistance. The A-01 has a simplified one-button setup function and features a unique current limiter with a timer function that allows you to program the length of time the current limiter will operate after the throttle trigger has first been squeezed. The A-01 also includes an optional mounting harness that allows it to be easily installed on and removed from the chassis. Additional mounting harnesses are available so that one controller can be used in several cars.

## Hobby Shack '99 Schedule

The Southern California-based retailer and parking-lot racing authority Hobby Shack is ready for the '99 racing season that started in early March and continues through late October. Because of large turnouts—more than 200 entries at some events—Hobby Shack plans to trim some of the racing classes but, as always, the "run what you bring" philosophy will be honored. The company also plans a large Hobby Shack Expo for Saturday, June 5, as well as a special off-site racing event on Saturday, August 14, at Hitec RCD's brand-new San Diego County facility. Get your entries in early!

- Saturday, March 6—Mission Viejo
- Saturday, March 20—Riverside
- Sunday, April 18—Fountain Valley
- Sunday, April 25—Rancho Cucamonga
- Sunday, May 2—San Diego
- Sunday, May 22—Mission Viejo
- Saturday, June 5—Rancho Cucamonga (Hobby Shack Expo)
- Sunday, June 13—Fountain Valley
- Sunday, July 11—Riverside
- Sunday, July 25—San Diego
- Saturday, Aug. 14—Hitec Race (tentative)
- Saturday, Aug. 28—Mission Viejo
- Saturday, Sept. 11—Riverside
- Sunday, Sept. 26—San Diego
- Sunday, Oct. 10—Rancho Cucamonga
- Sunday, Oct. 24—Fountain Valley

## RACER TIP OF THE MONTH

■ Frank McKinney Web Master for HPI Racing



Here's a cool tip that will help your nitro-powered on- or off-road vehicle stay cleaner during a hard day of racing. Since most of the fuel that you'll find all over the chassis at the end of a race comes from fuel spills during those lightning-quick refueling pit stops, it makes sense to install a fuel

trap on the gas tank.

A touring-car-tire foam insert can absorb the fuel that's spilled during a refueling pit stop. How? Simply wrap the foam insert around the fuel tank, and you'll have an effective fuel trap that will keep your car or truck cleaner during a day of racing. You may need to cut away some of the material around the foam insert to make it fit properly, but a standard-narrow insert will work on most 75- to 85cc fuel tanks. Give it a try.









## RACER news

### INNOVATOR AT WORK

## Bob Novak

**N**ovak's electronic speed controllers, chargers and receivers are and always have been used by many of R/C's most successful drivers, and multiple national and world championship titles have been won with them. Much of the company's success has been attributed to Novak's talented engineering, R&D and customer-service staffs, but behind every successful business you'll usually find a visionary leader. Company owner Bob Novak is a prime example of such a visionary, and the following interview highlights some of his philosophies, both in business and his daily life.

**Radio Control Car Action:** Bob, it's always a pleasure to see you. I'm certain that our readers would like to know a little more about how Novak started and about some of the company's future plans. Tell us a little about your education and the type of business you were in before you became involved in R/C.

**Bob Novak:** After I graduated from Iowa State University in 1965 with an electrical engineering degree, I went to work as a crystal oscillator design engineer with a company in Illinois.

**RCCA:** When did you first discover R/C cars, and what made you decide to seek a career in the R/C business?

**BN:** Building and flying R/C airplanes was a hobby of mine when I was in high school. In those early times of R/C, we had to build our own radios; that's how I got interested in electronics. I made a decision early on that I wanted to get an electrical engineering degree and get into the R/C business. I flew my first R/C plane in 1956 and went to work for an R/C manufacturer in California in 1968. In 1970, I started my own company called R.S. Systems. We built complete radio systems for airplanes. And yes, the radios were orange—of course.

Later, with the financial help of a partner, we built R.S. Systems into a medium-size manufacturing company with about 25 employees. As happens with many partnerships, we parted ways, and I started over again with Novak Electronics. That's when my family really became involved with the business. My wife, Joan, and my two daughters, Laura and Linda, helped me manufacture receivers and servos for airplane pylon rac-

ers. The servos I designed for the pylon racers were the first truly fast servos on the market. Our first product, the Bantam Midget servo, had a transit time of 0.2 second for 90 degrees of travel to accommodate the speed of the pylon racers. These planes traveled at speeds in excess of 180 miles per hour at times, and an extremely fast servo was necessary.

It was this servo that caught the attention of the  $\frac{1}{12}$ -scale electric-car racers. They were

in dire need of a very fast, small servo that would hold up under the rigors of  $\frac{1}{12}$ -scale, electric on-road racing. Once the word got out, we couldn't make servos fast enough. That was when I decided to look into  $\frac{1}{12}$ -scale racing and see what it was all about. Once I had my first car—an Associated RC12C, I believe—I was hooked. And my airplane racing has taken a back seat to cars. I still enjoy flying, but I don't do it as much as I used to.







**RCCA: When was Novak Electronics officially launched, and how many people worked there?**

**BN:** Novak Electronics was officially launched in 1978 with four people, total. Currently, we have over 40 employees. We are one of the few companies in the R/C industry that has degreed engineers on staff. In fact, over 15 percent of our workforce are degreed engineers. In addition

to designing all our own products, we do all of our manufacturing on site. This way, we are able to maintain product quality and quickly implement design changes.

**RCCA: When did you design your first speed control?**

**BN:** Our ESC technology really started back in the early 1970s. I designed several low-current, reversible speed controls for special projects, one of which was an electric R/C boat. These were essentially servo amplifiers that were modified to operate with a proportional speed output instead of a proportional position output. After our servos caught on in the R/C car industry, it was apparent that the variable-power resistor controlled by a servo could be replaced with the modified servo amplifiers that I had designed in the early '70s; that is, if some kind of power transistor could be used that did not have the 1-volt drop that bipolar transistors had ....

Fortunately for the R/C industry, a power transistor technology called Power MOSFETs was coming into its own. The price and performance of these transistors had reached a point where they could be used in the R/C industry. As soon as this happened, Novak Electronics came out with its first electronic speed control, the NESC-1, in 1984. In 1985, the NESC-1 won both the 2WD and the 4WD Off-Road World Championships.

**RCCA: Novak's latest entry-level ESCs include features pioneered by the high-end models. How does fresh technology trickle down the product line?**

**BN:** The trickle-down technology is fairly com-



**Bob relaxes with one of the company's resident pets. Bob is quite a sportsman, as evidenced by all the athletic equipment in the background.**

mon in the electronics industry. New ideas and new technologies are typically introduced into high-end R/C products to give top drivers a performance advantage. As the initial R&D expense is recouped, it becomes economically feasible to offer these new technologies in our entry-level products. Novak has always prided itself on designing advanced features and making them available to the average hobbyist.

**RCCA: It seems as if the high-end ESCs continue to get more sophisticated. In your opinion, can we push the envelope even further?**

**BN:** We are always pushing the envelope! Novak is a product-driven company, and we have brought many advances to the industry. Some of the features we introduced to the speed-control industry are solid-state RVP—reverse voltage protection—One-Touch Set-Up and Polar Drive Technology. Polar Drive Technology has enabled us to switch the power transistors on and off in our speed controls faster, and this makes them more efficient. We plan to continue bringing innovative ideas to our products.

**RCCA: I was speaking to Novak chief engineer Adnan Khan the other day, and he told me that the new Millennium charger uses a battery-charging technology similar to that used by NASA to charge its batteries in space. Is this true?**

**BN:** This is absolutely true. Our engineering team evaluated many charging schemes, and after much testing, we felt that this method of reverse pulse-charging gave the best results.

**RCCA: I always enjoy visiting Novak because of the company's casual family atmosphere. You make your employees really feel at home, and you even encourage them to bring their pets to work. I kid you not; I always feel like I'm at the zoo when I visit you guys. What's the scoop?**

**BN:** I have always felt that animals have a calming effect on humans. In early Novak years, we had a Burmese python named Monty. He was a great hit with our

walk-in customers. He finally got a little too big, and we had to find him a good home. Currently, we have tropical fish, an assortment of reptiles—mostly geckos—and occasionally, a pet dog or cat. One such resident pet was recently featured in our ad; he's the snoozing Siberian husky. The puppy you saw here today was rescued by one of our employees. The puppy now lives with my daughter.

**RCCA: It seems as if every time I see you, you're walking on crutches because you're recovering from a snowboarding accident, or you have a couple of fingers wrapped up in a splint after a softball mishap. If you don't mind my saying so, you live an incredibly active life for a gentleman who is old enough to have adult children. What activities do you enjoy most, and where do you find the energy to keep up with such a fast-paced lifestyle?**

**BN:** The sport I enjoy the most outside of the business is softball, which I play twice a week. I also enjoy scuba diving—I now have more than 125 dives—snowboarding, fishing, mountain biking, golfing, boating and wakeboarding—a new activity for me. I have always been an active person, and I have always enjoyed sports. My philosophy has always been to have fun with life. Most of my friends are younger, which gives me an incentive to keep up. My father is 85, and he still gets around pretty well.

**RCCA: Thank you for your comments, Bob. I wish you, your family and everyone at Novak a happy and prosperous 1999.**





# RACER news

## Speed Shop

### RPM Illusion Touring-Car Wheels



RPM's\* Illusion 9-spoke directional wheels are modeled after their full-scale street counterparts. These unique wheels feature sleek, variable-geometry blades that start at the hub center then twist to meet the wheel's outer diameter. The full-scale wheel actually works as a fan; it sucks the air from under the chassis and, in theory, the R/C version should provide the same effect. According to company owner Richard Royal, however, the R/C versions will not have the same dramatic effect as the full-scale wheels unless the car is driven sideways all the time (Richard obviously hasn't seen me drive!).

The Illusion wheels look stylish and are molded from RPM's practically indestructible blend of nylons. They're also available in natural, white and chrome finishes, in both standard and super-narrow widths. These wheels are truly something to see, and when they spin, they put your competition into a hypnotic trance (just kidding).

Standard width—part no. 80871 (white), 80873 (chrome).

Super narrow—80981 (white), 80983 (chrome).



### New Super-Size Wheel and Tire Options from GTP California

Now that HPI's Super Nitro RS4 is available, many "super touring class" racers are looking for high-quality racing tires and wheels that will help them lower their lap times. Kyosho SuperTen and Tamiya TGX racers have been using Ride\* and Cross racing tires and wheels to help them dial in their cars, and now, Super Nitro RS4 racers can benefit from Ride's years of testing and racing.

Ride offers inner-mesh-overlay racing slick tires in three temperature-rated compounds. The V-compound is designed for cooler track temperatures and is extremely sticky; the S-compound is for normal track temperatures, and the G-compound is perfect for when the track is hot. All three compounds include high-quality foam inserts and are available in standard and wide.

Looking for radials? Cross offers its unique dual-tread direc-

tional radials in medium-, super- and ultra-grip compounds. These scale-looking tires offer tremendous grip on both treated and untreated track surfaces, come equipped with foam inserts and are available in standard and wide.

How about some high-quality wheels to go with those tires? Cross offers three styles to suit your taste. Choose from the mesh, 15-spoke or 5-spoke design in standard or wide. Keep in mind, however, that the wide rear wheels will only work on the Super Nitro RS4 when stretched out to 300mm.

#### Inner-mesh-overlay tires

Standard width—part nos. TKS 7660-V, TKS 7660-S and TKS-7660-G, \$21.99.

Wide—TKS-7660-VW, \$23.99, TKS-7660-SW, \$21.99, TKS-7660-GW, \$23.99.

#### Radial tires

Standard width—AS-301GP (super-high grip), \$16.99, AS-301M (medium-high grip), \$13.99, AS-301SP (ultra-high grip), \$16.99. Wide—AS-303GP (super-high grip), AS-303SP (ultra-high grip), \$19.99.

#### Wheels

Standard width—AS-318GP (5-spoke, white), \$10.99, CWS-1 (15-spoke, white), \$6.99, AS-313GP (mesh, white), \$10.99. Wide—AS-319GP (5-spoke, white), \$10.99, CWS-2 (15-spoke, white), \$9.99, AS-314GP (mesh, white), \$10.99.







# RACER news

## Speed Shop

### Four-Stroke Kyosho SuperTen Chassis from Cross Racing Equipment

Four-stroke nitro-powered R/C car racing is very popular in the Land of the Rising Sun, and it just might become popular here in the States now that Cross Racing Equipment\* has released a 4-stroke racing chassis for the Kyosho SuperTen. The Cross SuperTen aluminum main chassis is 4mm thick and has been machined wherever possible to reduce weight. The chassis is anodized in brilliant gold to match Kyosho's optional SuperTen gold-anodized upper deck, and it is designed to accommodate an O.S. Surpass 26 or other 4-stroke engines of similar size and design.

Cross also offers aluminum upper and lower front- and rear-suspension arms, countershaft blocks, universal drive shafts and many other gold-anodized components for the SuperTen. Look closely at the O.S. engine, and you'll notice the nicely machined Cross aluminum valve cover and crankcase cover.

4-stroke aluminum main chassis—part no. AS-19GP, \$134.99.

Aluminum upper and lower suspension arms (F/R)—AS-53GP/AS-54GP, \$106.99.

Aluminum countershaft blocks—AS-13GP, \$52.99.

Universal shafts (1 pair)—AS-50GP, \$41.99.

O.S. aluminum valve cover—AS-410GP, \$43.99.

O.S. aluminum crankcase cover—AS-411GP, \$35.99.



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Racing



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# RACER news

## RACER PROFILE

### Josh Cyrul

Team Trinity factory driver Josh Cyrul has won more than 15 ROAR and NORRCA 1/12- and 1/10-scale on-road national championships and is a past IFMAR Worlds A-main finalist. He's ranked among the top 10 best drivers in the world and is also an accomplished 1/8-scale gas on-road champion. We caught up with Josh on his return from the Trinity Road Course Challenge and asked him what he's been up to lately.

### VITAL SIGNS

Age: 20

Occupation: CAD engineer and pro R/C driver

Hometown: Livonia, MI

Years racing: 13

First R/C car: Tamiya Holiday Buggy

Favorite racing class: 1/12-scale on-road

Favorite track: Larry's R/C Performance (home track)

Favorite race: U.S. Indoor Championships in Cleveland

Sponsors: Trinity, TRC and Novak



**R/C Car Action:** I understand you just returned from the Trinity Road Course Challenge; how did you and your team do?

Josh Cyrul: We did very well, thank you. Barry Baker won the Touring-Car Stock class, and I won Touring-Car Mod. Our newest teammate, David Chester, won the 1/12-scale Stock and Mod classes as well. It was a great race, and we had a lot of fun.

**RCCA:** You're a young guy yet you've come a long way in your racing career. How old were you when you first started racing, and who introduced you to R/C?

JC: My Dad actually introduced me to the hobby, and I started driving when I was 7 years old. My father has been racing R/C cars for over 25 years and has won a few championships, including the ROAR Masters. My dad wouldn't let me race on a track until I had a lot of practice. When I was 9 years old, he told me that when I got good enough, he would take me to the track to race—not to watch. He let me compete when he felt I was ready, and by age 14, I was making the A-mains at major racing events.

**RCCA:** When we last spoke, you were still in school; how are your studies coming along? And how do you find the time to race, practice and study?

JC: Actually, right now, I'm not in school, but I definitely plan to go back to complete my studies as soon as possible. When I was attending school, I always worked hard to finish early so I wouldn't fall behind. At present, I race on Friday nights and Sunday afternoons. Before a big race, however, I'll race more frequently.

**RCCA:** I understand that your parents are very supportive of your racing and that they travel with you frequently.

JC: I have to say that I have the best parents a kid could ever ask for. And I'm going to take this opportunity to thank my Mom and Dad for everything! I have traveled with a lot of other people whom I regard as family, and it would be impossible to mention them all. The ones who stand out, though, are Mike Reedy, Jim Dieter and Andy Power. I've had a lot of fun and learned a lot from them.

**RCCA:** What's it like competing in the shadow of teammate Joel Johnson, who is arguably one of the most recognized R/C celebrities? Do you feel that racing with Joel makes you push yourself even harder, or do you gain comfort from knowing that he's always there fighting for the same cause?

JC: I've been racing against Joel—or on the same team with him—for a while now, and I have to say that it has been great. We've only been on the same team for a short while, but even before I ran for Trinity, I learned a great deal from him. He's one of the best

racers of all time and has earned his status. I, on the other hand, am still earning mine.

**RCCA:** You looked incredibly dialed at the Worlds in England—in all three classes, in fact. You were clearly just as fast as your teammate David Spashett and even posted the fastest single lap time in the 1/10-scale class. How did it feel to travel so far and come so close to winning a world championship, only to have it slip away due to misfortune during the Mains?

JC: Obviously, I was disappointed, but I can't really complain. I was at my most competitive during the IFMAR Worlds, and I experienced what it was like to run up in front of the best drivers in the world. Now I have a better idea of how to prepare and practice for the next Worlds.

**RCCA:** While we're on the subject, did you feel that the 10-second false-start penalty you incurred during the first leg of the Pro 10 Mains was fair? Would you have had a shot at the championship if not for the penalty?

JC: Yes and no. I did roll before the start, so I did deserve a penalty, according to the IFMAR officials. Unfortunately, it was a slight radio glitch like the ones Joel Johnson and Mike Swauger experienced during some of their heats that caused my car to move on the grid. My car rolled forward 3 inches, but we still had 9 seconds until the race started. I wasn't even looking at my car when it happened, so I wasn't aware of it until I heard the announcement and all the commotion that followed. I saw the videotape after the race that showed my car in the act of the "crime."

Ten seconds was a little extreme for a penalty; it dropped me from first place to eighth place in that race. After that, I pushed myself too hard and made several bad mistakes. I'll never know how I would have done at the Worlds if it weren't for the penalty. Chances are, it wouldn't have changed anything, but all I can do is learn from it and try not to let it happen again.

**RCCA:** What do you like to do when you're not racing? Do you hang out with fellow racers?

JC: Most of the time, I hang out with my racing buddies, but I enjoy in-line skating and ice hockey. I'm also in a bowling league with my Dad, uncle and cousin.

**RCCA:** What are some of your short- and long-term goals?

JC: To go back to school, graduate and then win a world championship.

**RCCA:** Thanks for your time, Josh. I wish you and your family the best.

\*Addresses are listed alphabetically in the Index of Manufacturers on page 209. ■







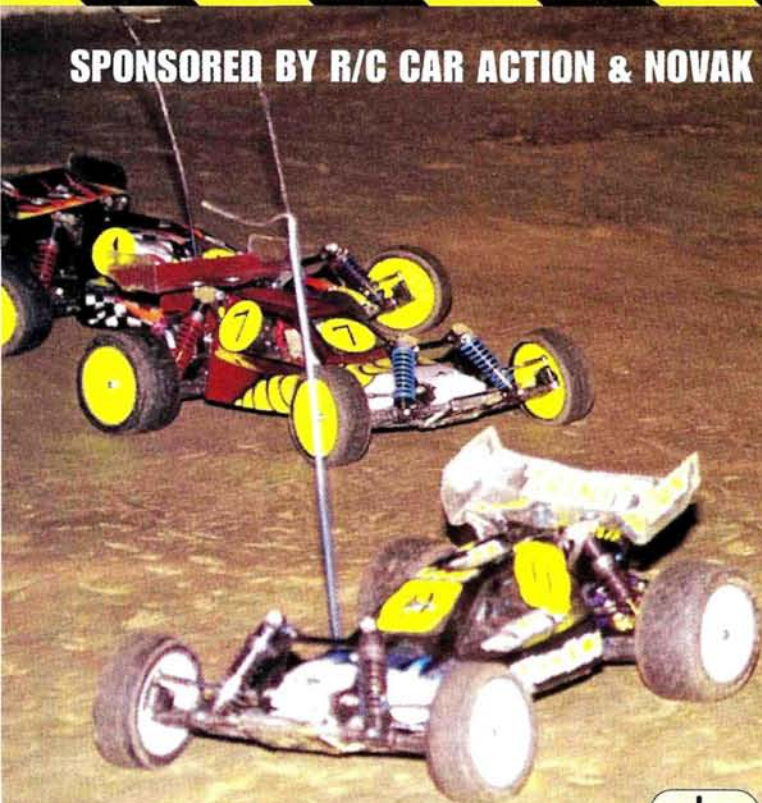
13TH ANNUAL

# Reedy

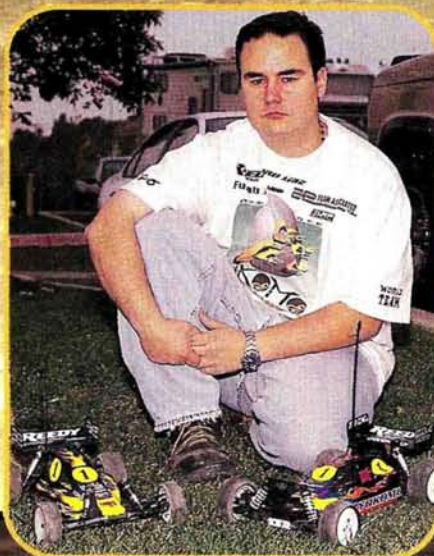
## INTERNATIONAL RACE OF CHAMPIONS

by George M. Gonzalez

SPONSORED BY R/C CAR ACTION & NOVAK ELECTRONICS



Add another candle  
to the birthday cake



Team Yokomo/  
Associated driver  
Frosty St. Clair took  
the TQ honors in both  
the 2WD and 4WD  
Open classes. He won  
the 2WD champi-  
onship but ran into  
trouble during the  
4WD main event, and  
that cost him the win.  
Frosty will be invited  
to join the Invitational  
class at the next  
event.





**T**he Reedy International Race of Champions is one of the oldest annual non-sanctioned racing events in our sport, and it's the race that launches the off-road season every year. Now in its 13th year, the Reedy Race is still an extremely popular venue that attracts contestants from all over the world. European drivers Craig Drescher (Great Britain), Jukka Steenari (Finland) and Teemu Lieino (also from Finland) were just some of the international contestants who traveled thousands of miles to swap paint with the best racers in the U.S. As always, the action was intense—and surprising.



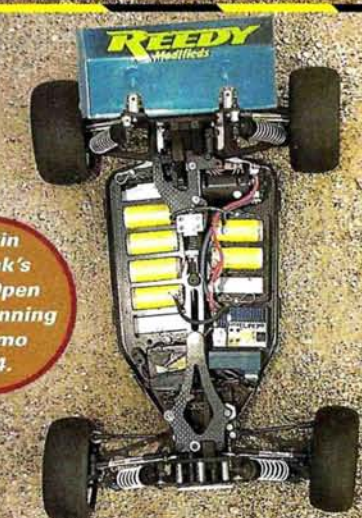
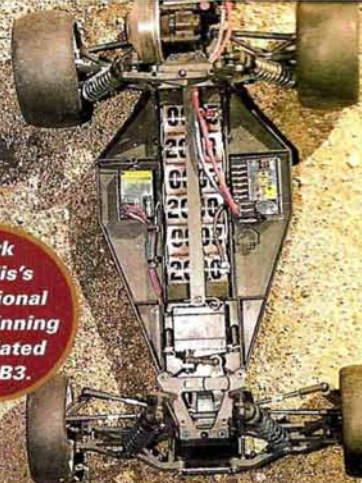
The Invitational class's top 15 drivers.

Mark Pavidis's Invitational class-winning Associated RC10B3.

Austin Dvorak's 4WD Open class-winning Yokomo MX4.

Mark Pavidis's Invitational class-winning Yokomo MX-4.

Frosty St. Clair's top-qualifying and 2WD Open class-winning Associated RC10B3.



PHOTOS BY GEORGE M. GONZALEZ





Left: Greg Hodapp is back with Trinity, so now the "Gold Dust Twins"—Greg and Brian Kinwald—have been reunited.



Left: Team Yokomo driver Craig Drescher smiles as he works on his Yoke. Craig traveled all the way from the United Kingdom to compete.

## OPEN CLASS QUALIFYING AND A-MAIN OVERVIEW

• **2WD Open.** The action in this class was every bit as close and exciting as the action in the Invitational; in fact, all 10 drivers qualified on the same lap, less than 4 seconds apart. After the four qualifying rounds, Team Associated driver Frosty "The Iceman" St. Clair had barely beaten Jeremy Kortz (by less than 1/10 second). Lloyd Dassonville and Jason Corl were

less than 1 second behind the leaders, while Randy Brown and Eddie Bernal finished 2 seconds later.

During the single A-main, St. Clair got the holeshot, and that put him in the lead for most of the race. A cluster going though the chicanes shuffled the grid, but

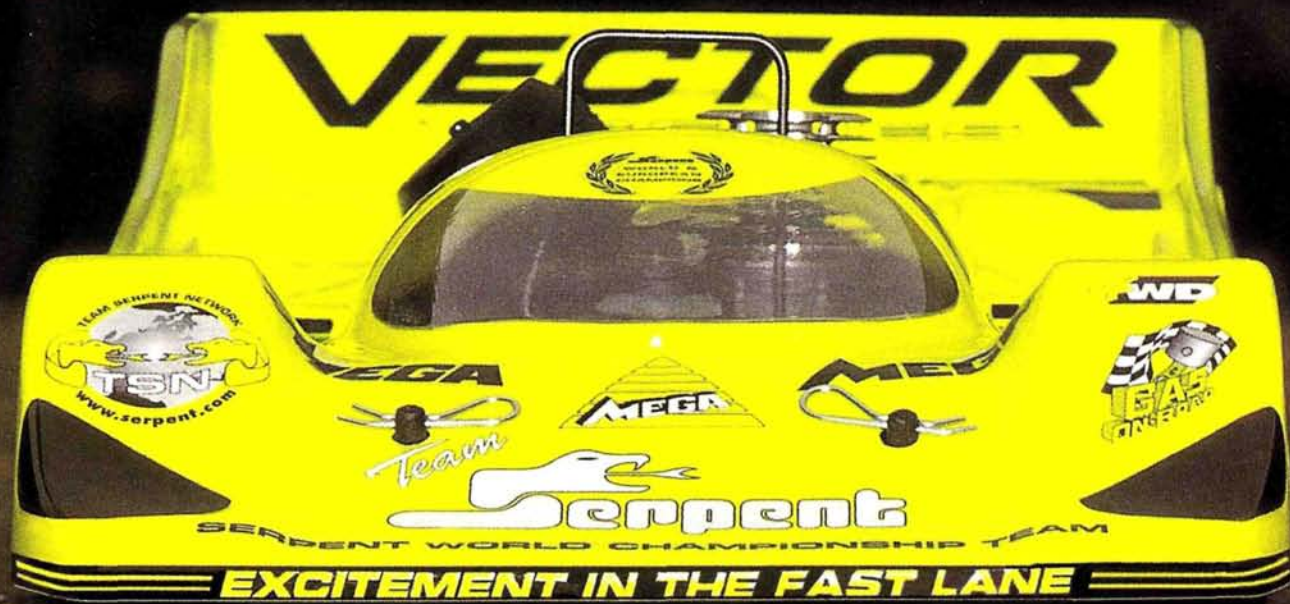
Dassonville emerged unscratched and quickly went after the leader. Unfortunately for Dassonville, the 4 minutes came and went quickly, and toward the end, St. Clair turned it on to finish with a large, 3-second margin. St. Clair will join the Invitational drivers at the next Reedy Race. Furutani, Corl, Kortz,

## W I N N E R S

### Invitational

Fin.	Points	Driver	Chassis(2WD/4WD)	Motor	Battery	ESC	Radio
1	.12	Mark Pavidis	Associated/Yokomo	Reedy	Reedy	LRP	Airtronics
2	.15	Matt Francis	Losi/Losi	Trinity	Trinity	LRP	Airtronics
3	.16	Brian Kinwald	Losi/Losi	Trinity	Trinity	Novak	Airtronics
4	.18	Jukka Steenari	Losi/Losi	Team Orion	Team Orion	Novak	Airtronics
5	.26	Greg Hodapp	Losi/Losi	Trinity	Trinity	NA	NA
6	.29	Travis Amezcua	NA	Team Orion	Team Orion	NA	NA
7	.41	Sohrab Tavakoli	Losi/Losi	Team Orion	Team Orion	Novak	Airtronics
8	.42	Mark Francis	Losi/Losi	Trinity	Trinity	NA	NA
9	.45	Jimmy Babcock	Losi/Losi	GM	GM	GM	Airtronics
10	.45	Scott Hughes	Associated/Yokomo	Reedy	Reedy	LRP	KO Propo

# PURE EXCITEMENT VECTOR Spec 99



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Mellin, Monise, Brown, Mangelsdorf and Bernal finished third through 10th, respectively.

• **4WD Open.** Frosty St. Clair was clearly the man to beat. He posted a super-fast

14/4:15.52 time—more than 1 second faster than Lloyd Dassonville's 14/4:16.94 best time—to claim the TQ. Jeremy Kortz ended up half a track behind the leaders, but he managed to finish on the same lap.

The main event spelled disaster for TQ St. Clair; a bad start sent him to the back of the pack, and that meant he had to pass the entire field to rejoin the action. Austin Dvorak got a lucky break and took the lead, while the rest of the drivers were

## W I N N E R S

2WD Open										
Fin.	Qual.	Driver	Chassis	Motor	Battery	ESC	Radio	Body	Tires (F/R)	Additive Pinion/spur
1	.1	Frosty St. Clair	Associated	Reedy	Reedy	LRP	Futaba	Pro-Line	Pro-Line	Trinity 19/81
2	.3	Lloyd Dassonville	Associated	Reedy	Reedy	LRP	Airtronics	Associated	Pro-Line	Trinity 20/81
3	.8	Derek Furutani	Losi	Peak	Peak	Novak	Airtronics	Losi	Losi	Trinity 20/84
4	.4	Jason Corl	Losi	Trinity	Trinity	LRP	Airtronics	Losi	Losi	Trinity 20/81
5	.2	Jeremy Kortz	NA	Peak	Ballistic	Tekin	JR Racing	NA	Pro-Line	NA 18/81
6	.10	Mike Mellin	Losi	Trinity	Trinity	Novak	Airtronics	Losi	Losi	Trinity 19/84
7	.9	Greg Monise	Losi	Team Orion	Team Orion	Tekin	Sanwa	Losi	Losi	Trinity 21/86
8	.5	Randy Brown	Losi	Trinity	Trinity	Novak	Airtronics	Losi	Losi	Trinity 20/84
9	.7	Dave Mangelsdorf	Losi	Trinity	Trinity	Novak	Airtronics	Losi	Losi	Trinity 20/86
10	.6	Eddie Bernal	Associated	GM	Team Orion	LRP	Airtronics	Pro-Line	Pro-Line	NA 20/83

4WD Open										
1	.4	Austin Dvorak	Yokomo	Reedy	Reedy	LRP	Airtronics	Yokomo	Pro-Line	NA 17/84
2	.1	Frosty St. Clair	Yokomo	Reedy	Reedy	LRP	Futaba	Yokomo	Pro-Line	Trinity 18/84
3	.8	Chad Bradley	Schumacher	Reedy	Reedy	LRP	Hitec	Schumacher	Pro-Line	Trinity 17/95
4	.5	Derek Furutani	Losi	Peak	Peak	Novak	Airtronics	Losi	Losi	Trinity 18/84
5	.6	Mike Mellin	Losi	Trinity	Trinity	Novak	Airtronics	Losi	Losi	Trinity 18/84
6	.3	Jeremy Kortz	Losi	Peak	Ballistic	Tekin	JR Racing	NA	Pro-Line	NA 17/84
7	.2	Lloyd Dassonville	Yokomo	Reedy	Reedy	LRP	Airtronics	Yokomo	Pro-Line	NA 18/81
8	.7	Dustin Biber	Yokomo	Reedy	Reedy	Tekin	Hitec	Yokomo	Pro-Line	NA 17/84
9	.9	Greg Degani	Yokomo	Fantom	Pro-Match	LRP	Futaba	Yokomo	Pro-Line	NA 17/87
10	.10	Shawn Dassonville	Yokomo	Reedy	Reedy	LRP	NA	Yokomo	Pro-Line	NA NA

# PURE EXSITEMENT

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Our totally new Team Serpent Network website is a lot like our Vector Spec 99 – fast, powerful, and loaded. Set-up a [customized home page](#) that presents the info *you* want (even the [language](#) you want it in, comprende?). See which friends are on-line and jump into a [chat](#) to discuss important topics like fuel consumption, tires and which race has the best track food. [Ask the Pros](#) technical questions, and the [racer forums](#) let everyone rant and rave.

Thinking of buying a Serpent? Check out the [Vector Spec 99](#) features that propel it from 0-60 in 1.5 seconds and send it down the straight at over 70. Read how it swept the Worlds in one of many [race reports](#). When you're ready to join the fun, you can even sell your old car in our marketplace and find a [Serpent shop](#) near you. Don't mention it ;-).

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# Reedy Race Hall of Fame

**M**ark Pavidis now enters the record books as the third driver to win twice at the Reedy Race. Unfortunately, Team Yokomo factory driver Masami Hirotsuka was unable to attend this event. Because Cliff Lett has now retired from racing, Hirotsuka and Pavidis are the only drivers who have a shot at "three-peating." With drivers such as Brian Kinwald, who will be gunning for his second win, and Matt Francis, who would like his name near his brother's in the Reedy Race Hall of Fame, the next race should be very exciting.

## PAST REEDY RACE CHAMPIONS:

**CHRIS ALLEC**—ASSOCIATED  
**MARK FRANCIS**—ASSOCIATED  
**MASAMI HIROSAKA**—YOKOMO (TWO WINS)  
**GREG HODAPP**—LOSI  
**RICK HOHWART**—ASSOCIATED  
**BRIAN KINWALD**—LOSI  
**JEREMY KORTZ**—LOSI  
**CLIFF LETT**—ASSOCIATED (TWO WINS)  
**CHRIS MOORE**—KYOSHO  
**MARK PAVIDIS**—ASSOCIATED (TWO WINS)

# The History of . . .

**F**or those who may be new to the hobby, here is an explanation of how the Reedy Race began: it was organized to celebrate the birthday of world champion motor builder Mike Reedy—one of R/C racing's founders. It was the goal of the racers who organized the event to create a fun, unique venue that would entertain Mike and all the guests, spectators and contestants who attended.

The race had to be unique, so the organizers created a special Invitational class, and the best R/C drivers in the world were invited to compete in it. Instead of running the usual racing format with qualifiers and main events, they envisioned a 12-round endurance race in which the contestants competed in 6 rounds of 2WD mod racing and then in 6 rounds of 4WD mod racing. The drivers were awarded points according to how they finished in each of the 12 rounds, and the accumulated points determined their final score (i.e., first = 1 point; second = 2 points; third = 3, etc.). A driver's worst score from each competition was discarded and used only in the event of a tie, so just 10 of the 12 rounds counted toward a driver's final score. Accordingly, the driver with the lowest score was declared the champion (the lowest possible score being a 10).



The Reedy Race was so popular that it became an annual event, and after 13 consecutive years, it is still one of the most popular off-road races of the season—a fun race for contestants and spectators. In addition to the Invitational class, there are the 2WD and 4WD Open. All drivers may participate in them, and the lucky (and talented) winners of each class are automatically invited to compete in the Invitational at the next year's Reedy Race. The Open competitions are available to the first 150 drivers who sign up; many drivers are turned away every year, however, because the slots fill up quickly.

## Drivers' point of view

Each had his own viewpoint, but they agreed on who the toughest competitors were. Here's what they had to say.

**R/C Car Action:** How does the Reedy Race compare with, say, a ROAR national championship in terms of the preparation involved and the level of competition? Is it more fun? More stressful? What's your opinion?

**Mark Pavidis:** As far as the Invitational class goes, it's more stressful because each heat is a main event, and you're not really going out there to get a good qualifying run; you're fighting for points, so ...

**Brian Kinwald:** It's a fun race, but it's not really fair because you can't race the same people an equal number of times. In addition, starting grid shuffling is not fair because there are no qualifiers to determine the grid order. Some drivers easily won their heats because they didn't have any serious competitors, while other racers had tough competitors in every heat. As far

as preparation goes, I'd say there's less preparation because of all the luck that's involved. Having your car dialed or being fast won't necessarily win the race.

**Matt Francis:** It's definitely more stressful because anyone can go out there and run one heat extremely fast and make the Main. But at this race, you don't always see the fastest guy win; it's usually the most consistent—and smartest—driver who wins. Before the race, Gil Losi Jr. told me, "Don't let your emotions get to you during the race; if you make a mistake, just get back in the pack and give it 100 percent." I generally do that anyway, but in a normal race where there are qualifiers, if you make too many mistakes, you know you're not going to make the Main. At this

race, though, you can never give up because you always have a chance. In this particular case, however, Mark Pavidis is just plain kicking our butts!

**RCCA:** How do you feel the competition compares with some of the past Reedy Races?

**MP:** I think this year, the competition has been wide open ... I mean, there are a lot of really good drivers here, both from the U.S. and from around the world, who are all going at it.

**BK:** I'd say the competition is pretty much the same as it was last year, and so is the track; the tires that we're running are the same, and that makes everyone equal. It's really easy to go fast around the track.

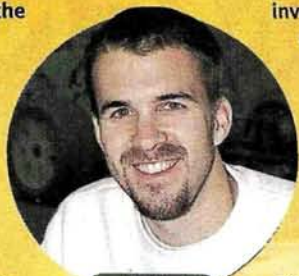
**MF:** All the Reedy Races I've competed in have been fun and challenging, and this year is no different. The shuffling of heats and grid orders is kind of up to the luck of the draw, and each year, it changes. One year the competition may be easier, and the next year it might be harder. You just never know; but that's part of what makes this event so challenging.

**RCCA:** Who is your toughest competitor this year?

**MP:** I'd have to say ... Brian Kinwald.

**BK:** Mark Pavidis. We've only raced twice, but he has been fast in every one of his heats.

**MF:** Probably Mark or Brian. Brian is just always deadly fast, but Mark seems to be faster and more consistent at this particular race.



**MATT**



**BRIAN**



**MARK**



left to battle it out for territory. In the last 20 seconds of the race, St. Clair struggled to the front of the field and was soon reeling in the leader, but he ran out of line a moment too soon. Dvorak finished with his name in the Reedy Race record books and qualified for the next Invitational. Chad Bradley, Derek Furutani, Mike Mellin, Jeremy Kortz, Lloyd Dassonville, Dustin Biber, Greg Degani and Shawn Dassonville finished third through 10th.



**Team Losi/GM driver Brian Dunbar just dropped by to swap paint with the best of 'em.**

Pavidis had 12 points and was declared the Invitational-class champion; with 15 points, Matt Francis claimed second; Brian Kinwald finished with 16 points to round out third.

### FINAL THOUGHTS

The 13th Annual Reedy International Race of Champions—like the 12 before it—was a glorious event filled with fun and excitement. For the third year in a row, the kind and efficient staff at M-n-M Raceway did a fantastic job of managing the event and, as always, were friendly hosts. *R/C Car Action* congratulates Team Associated factory driver Mark Pavidis for winning the Invitational



**Team Associated/Pro-Line driver Jason Ruona also likes to wear a smile while working.**

### INVITATIONAL-CLASS ACTION

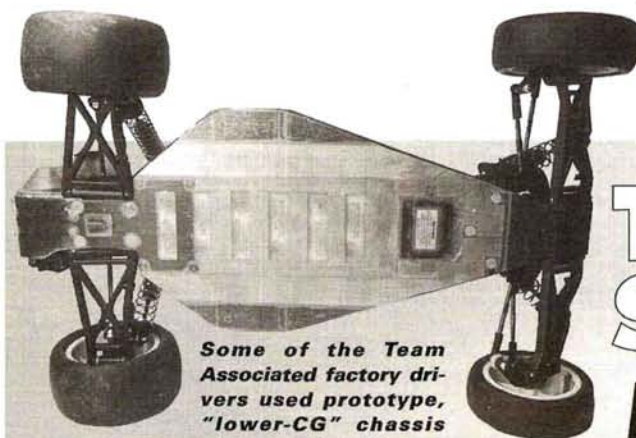
Because of the large number of contestants, four heats were held for each of the 12 rounds, and all heats were shuffled so the drivers competed against a different group each time. The grid order was also shuffled so the drivers had to start from a different position each time. Although this shuffling was somewhat controversial, the event was nevertheless exciting from a spectator's standpoint.

Team Associated factory driver Mark Pavidis took the "consistency" honors in the 2WD segment by taking five firsts and one third to claim a perfect 5-point score. Team Trinity/Losi factory driver Matt Francis won four times and took third twice to complete the first half with 7 points. Team Trinity/Losi factory driver Brian Kinwald ended up with two firsts and four seconds in the 2WD segment—a total of 8 points. Team Losi driver Jukka Steenari also finished with 8 points, and at the halfway point, he was still in the running.

The 4WD competitions were next, with the championship yet to be decided. Once again, Mark Pavidis clearly had the most dialed car and put on quite a show for the spectators. In one of the heats, he was in fourth place and needed to get around the leaders to go for the win. Going through the enormous triple-jump section, the leading cars doubled the first two jumps and then singled the last one to play it safe. Pavidis saw this as an opportunity and proceeded to sky the triple jump; he passed all three cars in the air to take the lead—simply amazing!

As it turned out, Pavidis ended up winning four, taking one third and finishing eighth in another (obviously, his throw-out round) for a total of 7 points. Matt Francis won two, finished second three times and took third once for a total of 8 points. Brian Kinwald also finished with 8 points, while Jukka Steenari finished with 10. After the scores had been tallied, Mark

class and Frosty St. Clair and Austin Dvorak for winning the 2WD and 4WD Open classes, respectively. My thanks also to track owner Joe Stanovich and announcer Daniel Adams for putting up with me for two days and to all of the racers who politely tolerated the flash photography; hope to see you all there next year. ■



**Some of the Team Associated factory drivers used prototype, "lower-CG" chassis plates on their B3s.**

## TRICK STUFF

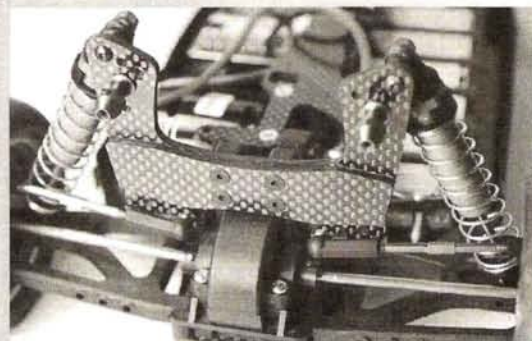
**A**t any major racing event, you'll find drivers testing new products or making certain modifications to their vehi-

cles to gain a competitive edge. The Reedy Race was no exception; I found many drivers trying out new setups and modifications to help them cope with M-n-M Raceway's unique track conditions.

The mostly clay, off-road track was relatively smooth, and the hard-packed surface provided plenty of traction; that's why slick tires were the only way to go. The track did not develop a groove along the more traveled lines, so traction was available just about everywhere.

Some of the Team Associated factory drivers used specially machined chassis plates on their B3 buggies. The chassis features battery cutouts for mounting the cells as low as possible; the area under the steering servo was also cut out, and prototype servo mounts were used to lower the servo.

The Yokomo factory drivers also did a little experimenting and used a special, one-piece graphite top plate to replace the two-piece unit with a flex-inhibiting shock absorber normally found on the MX-4 4WD off-road buggy. The top plate prevents the chassis from flexing, and this results in a more effective suspension. Mark Pavidis even installed a graphite cross-brace on his Yoke's rear shock tower to make it as rigid as possible. We're not sure whether any of these modifications will result in future chassis updates or optional parts, but it's always interesting to see what the fast guys are up to.



**Mark Pavidis strengthened his Yokomo's rear shock tower with a graphite cross-brace.**



# CLEAN YOUR CAR

*In the words of Monsieur Creosote, "Get me a bucket!" This is all you'll need to get your rig shiny and new again.*

**K**EEPING YOUR RIDE as clean as possible is essential for obtaining top performance and results during a race. I am obsessive when it comes to cleaning my cars; I clean them after each heat. From front bumper to motor mount and everything in between, nothing is missed!

There are several techniques for getting the grit out of your ride. Having a clean vehicle ensures that all components work properly, and, of course, it makes your car look good! Trust me; your car needs to look good at the starting line.



**Use a toothbrush to clean those hard-to-reach areas.**

## DON'T BLOW OFF BLOWING IT OFF

The best and most effective way to clean your vehicle is to use an air compressor. With a compressor, you can blow the dirt and grime out of almost every nook on the vehicle. The power of the forced air will clean most of your car or truck, and because it's just air, nothing—including your electronics—will be damaged. Simply aim the nozzle at the dirt and pull the trigger. Voilà; your car is clean. If there is a compressor at the track, I strongly suggest that you use it after each heat. A few minutes' worth of compressed air can equal an hour's worth of scrubbing.

## MORE AGGRESSIVE CLEANING

Off-road gas cars and other truly filthy vehicles require more aggressive cleaning methods than a mere windy blast from an air compressor. Denatured alcohol, available at your local hardware store, is the best solution for cleaning R/C cars. While you're at the store, pick up a heavy-duty spray bottle as well; it will outlast any spray head you might pirate from the kitchen cleaning supplies and will also provide a more forceful spray. Working over a towel or a tarp, simply blast the car clean. Don't worry about your electronics; denatured alcohol won't hurt them (but don't go out of your way to soak them, either). The only place you don't want to let the alcohol sit is on the engine; once it's clean,

wipe it off (or better still, blow it off with a compressor) and drip a little after-run or castor oil into the carb intake and glow-plug hole.

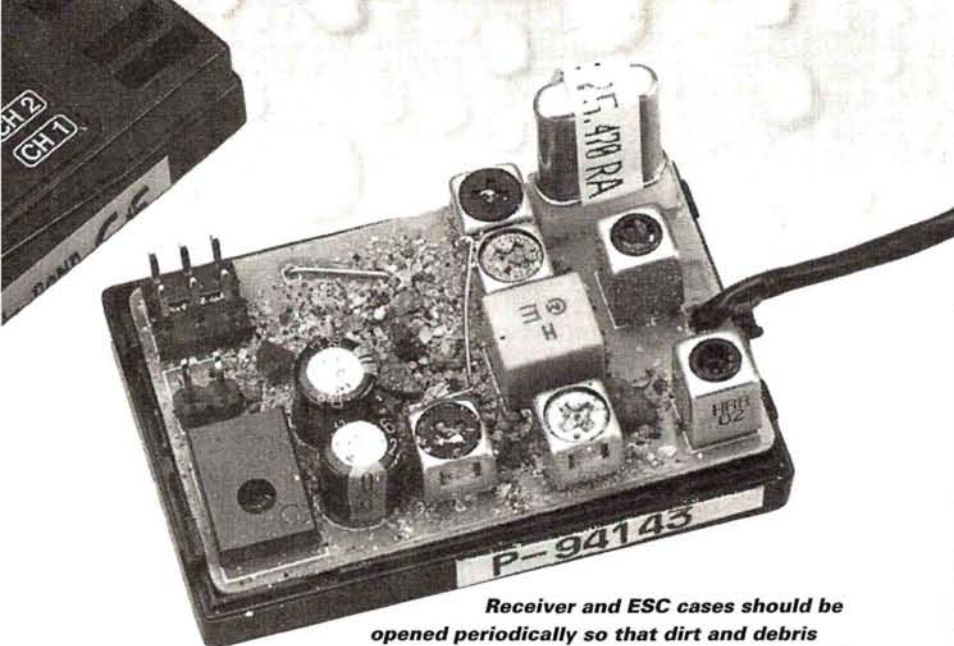


**Use a hobby knife, pin, or other pointy object to dig caked dirt out of screw heads. Once they're clean, put tape or Associated chassis-protector film over the screws to prevent dirt from getting in there again.**

## NETTY GRITTY

Your car should now be almost clean, but there may still be pockets of resistance where the dirt just won't let go. A toothbrush can reach most of the hard-to-clean areas (and I don't just mean in your mouth!). Grit that's trapped in the threads of 1/8-scale





**Receiver and ESC cases should be opened periodically so that dirt and debris can be removed. Use a soft brush or "canned air" to clean the circuit boards.**

## CLEANING ELECTRONICS

Although there are "electronics-safe" car cleaners, I just can't cotton to the idea of blasting fluid into my car's components. Whenever I happen to have removed the electronics from my car, I carefully open the cases to dump out any dirt or small stones that may have collected inside (you'd be surprised how much debris becomes trapped in there!) and brush off the circuits with a soft brush. It's a good idea to keep open plug slots (in receivers) and potentiometer holes (in ESCs) covered with tape to prevent just such contamination.



**Denatured alcohol is an excellent R/C car cleaner, but be careful not to let it sit on top of (or get inside) nitro engines.**

shock bodies, crud that's caked between bulkheads and suspension arms, and junk that's packed into the battery tray can usually all be removed with a toothbrush. For really tight areas such as the spaces behind hub carriers and the insides of unused camber-link holes, thread an alcohol-moistened pipe cleaner through the offending part.

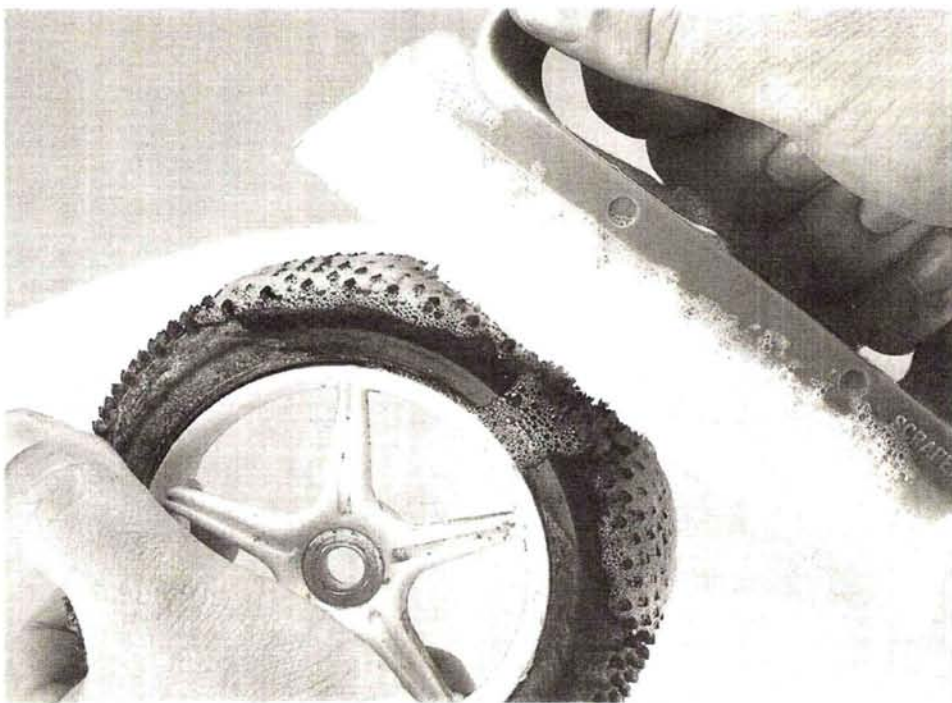
## HEAD CLEANER

Chances are good that after a heat, you will find dirt packed into the heads of the screws that are flush with the bottom of the chassis. Use the tip of a discarded hobby knife to pick out this stuff before it becomes permanently caked in there; it could prevent your screwdriver or Allen wrench from getting a good "bite." The dirt-packed screw problem can be avoided entirely by using Associated's chassis-protector film or even a few pieces of electrical tape strategically placed over the screw heads; I don't know why more racers don't take these precautions.

## TIRE TIPS

Most off-road racers brush off their tires between heats, but I like to go further and get a new-tire shine for the start of each race. The first step is to remove the heavy, caked-on dirt as you normally do, with a coarse brush. Next, I use an identical brush to scrub the tires with a bucketful of a 50/50 solution of Simple Green and water. This makes the tires "out-of-the-box" clean and seems to condition them slightly as well. Never dunk a mounted tire into the bucket of cleaning solution; if you do, it will rapidly trap the cleaning fluid in its foam liner, and it will take days to dry out! Once they are clean, towel off the tires and apply whichever traction compound you choose. If "show" is more important to you than "go," try using a "spray-and-walk-away" foaming tire cleaner intended for full-scale tires; it works just as well on the little wheels as on the big ones! Unfortunately, it also leaves them pretty slick for a few runs.

That's it! You are now ready to win the next heat, and your ride is as clean as the day it was built. At the very least, you have the satisfaction of having a clean car. If you make cleaning a ritual, though, you'll find that your vehicle runs better and its parts last longer, primarily because frequent cleaning helps you to notice when parts are worn or maladjusted. When it comes to preventive maintenance, a *clean* car is a *healthy* car. ■



**Use a stiff brush to scrub your tires between heats; a little Simple Green will make 'em shine.**



# PROJECT

by Greg Vogel

**C**an it be done? That is the most frequently asked question among radio control car enthusiasts, whether it's "Will this body fit that chassis?" or "Will this part work in that car?" Our response here at *R/C Car Action* is always the same; it all depends on your imagination and your bank account. Some projects, however, require a little more of both! I set out on my own personal quest for custom-car nirvana by hatching a plan to build a dual-engine version of Kyosho's .21-powered USA-1 monster truck. And that brought me back to the question: can it be done? Here's what I did to strap two .21 monster horsepower engines into a big-wheel terrain conqueror. I started with two kits—Kyosho MP-5 and USA-1—and went from there ....



*This photo of a stock USA-1 gives you a good idea of the transformation our project truck has gone through. A single .21 engine would not have enough torque for the high final-drive ratio created by the giant tires, so the stock truck uses a gear reduction unit. I omitted the reduction unit, since I had two snarling race engines to power the truck. I ain't reducin' nuthin'!*

# DUAL ENG

## OPTIONS • PART 1

### KYOSHO

- Special engine mount (2)—part no. KYOC 3459.
- Steel main gear—KYOC 4564.
- Fiber disk brakes (4)—KYOC 2591.
- Tuned-pipe mount (2)—KYOC 4650.
- M4 flathead washers—KYOC 9847.
- M3 flathead washers—KYOC 9846.

### HAMMAD GHUMAN

- Shock mounts (2 packs)—5201.

### GPM

- Machined diff housings—MP038.

### MIP

- CVDs—1211 (F/R); 1150 (center).

### PICCO

- P21ES engine (2).

## 1 CHASSIS CHOP

The truck is based on Kyosho's\* MP-5 race buggy chassis, which features front-end kick-up and should improve the truck's overall handling in sketchy terrain. To adapt the chassis for dual-engine use, I first made a template of the existing engine-mounting holes and flywheel opening. I then flipped the template over and used the gear opening as my guide to trace the holes for the second engine's mounts. Doing this meant the second engine has the same spacing and accommodates the same gear ratios as the engine in the stock position. I used a drill press, a Dremel\* tool and a round file to make the openings for the engine. While the chassis was on the press, I drilled an extra hole for the right-side pipe mount and countersunk all the holes. A few words of caution: the hard-anodized chassis is tough on tools. Be prepared to go through a few bits!

## 2 DRIVE TRAIN

I had to use the stock MP-5 gear boxes and differentials, since only they fit the MP-5 chassis. MIP\* CVD axles are a good upgrade for any kit, but especially for a heavy-hitter such as my project truck. I used CVDs to replace all the dogbones and conventional universals found on the Nitro USA-1.



## 3 BIG BRAKES

I bolted a steel main gear onto the center diff, as a plastic gear here would certainly get munched. I selected GPM's\* machined differential housings to secure the diff. With a pack of ponies under the hood, I definitely had to improve the truck's stopping power, so I installed four Kyosho fiber brake pads to bring the wheels to a halt.



# LINE USA-1

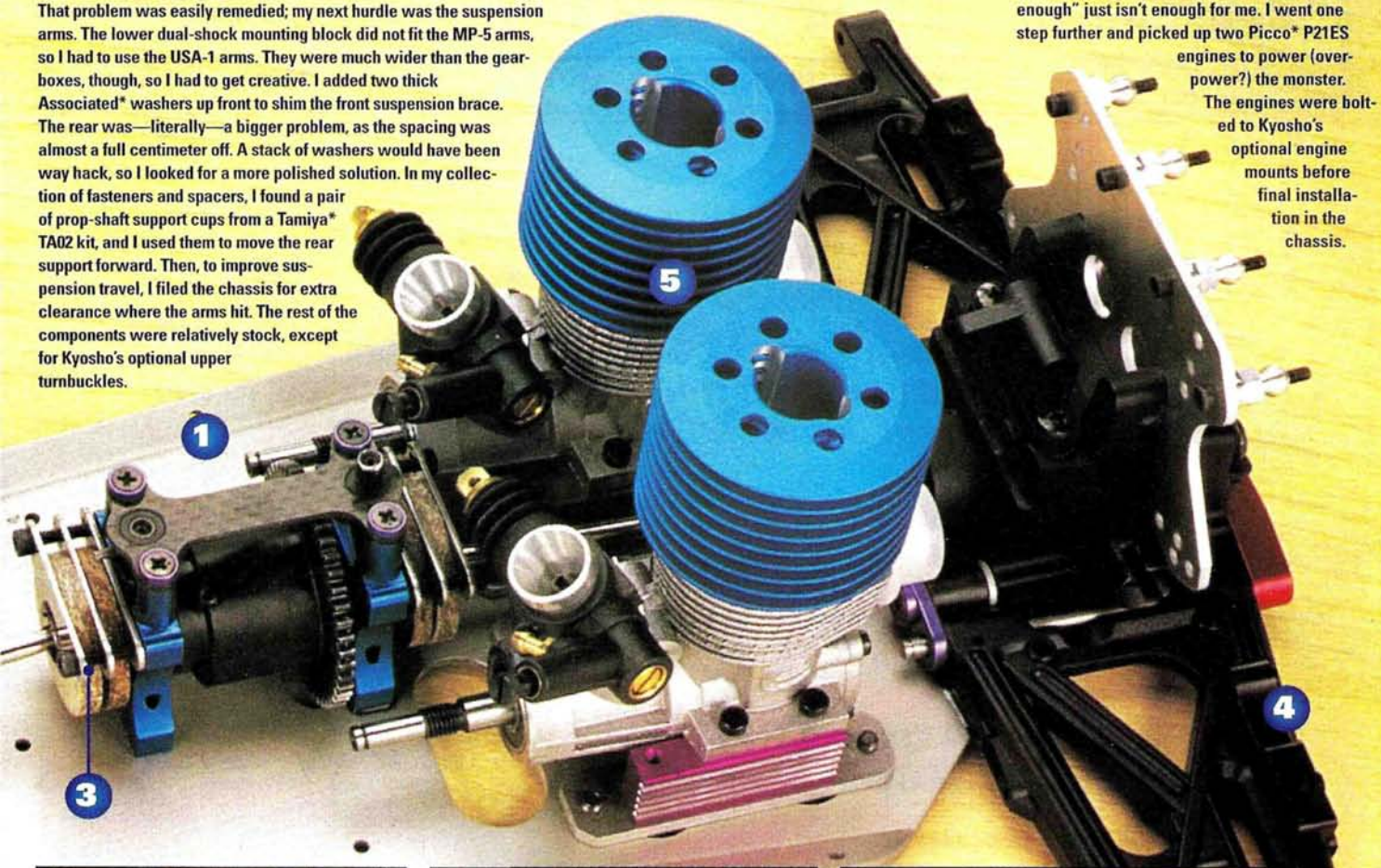
## DOUBLE TROUBLE PART 1

### 4 SUSPENSION

Although many of the MP-5's and USA-1's suspension components look similar, they are not interchangeable; only after toying with the parts from both vehicles did I discover that the USA-1 shock towers would not fit on the MP-5 gearboxes. The holes on the towers were about 2mm off, so I elongated them to fit. That problem was easily remedied; my next hurdle was the suspension arms. The lower dual-shock mounting block did not fit the MP-5 arms, so I had to use the USA-1 arms. They were much wider than the gearboxes, though, so I had to get creative. I added two thick Associated\* washers up front to shim the front suspension brace. The rear was—literally—a bigger problem, as the spacing was almost a full centimeter off. A stack of washers would have been way hack, so I looked for a more polished solution. In my collection of fasteners and spacers, I found a pair of prop-shaft support cups from a Tamiya\* TA02 kit, and I used them to move the rear support forward. Then, to improve suspension travel, I filed the chassis for extra clearance where the arms hit. The rest of the components were relatively stock, except for Kyosho's optional upper turnbuckles.

### 5 PACKING THE PONIES

Two .21 engines of any type would be more than enough power for this truck, but "more than enough" just isn't enough for me. I went one step further and picked up two Picco\* P21ES engines to power (overpower?) the monster. The engines were bolted to Kyosho's optional engine mounts before final installation in the chassis.



The front end didn't need as many spacers as the rear. I also cut a slot here to allow the suspension mount tab to exit through the chassis. I needed to redrill the mounting holes in the shock towers to fit the bulkheads.



Here is a close-up of the spacers that allow the USA-1 rear arms to fit on the MP-5 gear cases. I had to make a slot in the chassis for the aluminum suspension pivot's guide tab.



To install a second engine, I had to cut some new holes on the chassis's right side. I used a simple template to transfer the pattern. Drilling and cutting the holes is not easy; if you try this, be sure to clamp the chassis to a solid surface, take your time and wear safety goggles.

### UNTIL NEXT MONTH ...

As you can see, I had to overcome many obstacles at the beginning of the project. It certainly wasn't easy to cut the new mounting holes for the second engine, and spacing the suspension arms was definitely a challenge that took up a great deal of time. Stay tuned for Part 2; I'll show you how I conquered the

problems of hooking up the throttle linkage and fueling the two engines. You'll also see the final product in action, and yes, I promise to reveal the truck's top speed in an unlimited speed run!

\*Addresses are listed alphabetically in the Index of Manufacturers on page 209. ■



# NOVAK

# MILLENNIUM

## Take Charge!

by Peter Vieira



### MANUFACTURER SPECIFICATIONS

List price	\$249
Case size	4.00x4.38x2.33 in.
Weight	13.94 oz.
Input voltage	12 to 15 volts DC
Charging modes	Linear/reverse pulse/NiMH
Charging capability	4 to 8 cells (1.2 volts per cell)
Ni-Cd charge rate	0.5 to 7 amps
Trickle charge rate	0.1 to 0.4 amp
Reverse pulse duration	5 to 20 milliseconds
NiMH charge rate	0.5 to 1.5 amps
Unit protected from	Input reverse voltage, output reverse voltage, short-circuit, shorted batteries and thermal overload

**Y**ou get out what you put in. You've probably heard that from your parents, your coach, or your boss, and it is literally true for the Ni-Cd batteries we use to power our R/C vehicles. A fully charged, high-capacity racing pack is fundamental to electric vehicle performance. It's no surprise that charging technology is of vital concern to racers, but today's competitors want more from a charger than a good charge; they also want information. What exactly is the battery capable of? How much juice is in there?

With the most demanding racers and highest levels of competition in mind, Novak's\* engineers developed the unit you see here—the all-new Millennium. It is a “smart,” flexible charger that can juice up every rechargeable battery in your car or radio, and it follows up each charge with a complete report of what went into the cells. Does it perform as promised? Is it easy to use? With a fresh-from-the-box Millennium on the Radio Control Car Action test bench, I'm ready to power up and find out.



Here's the intake for the internal cooling fan. Although the rubber feet provide ample clearance, be careful not to block the airflow when you pit on a towel.

PHOTOS BY WALTER SIDAS



## POWER UP

Where's the AC plug? There isn't one; as a full-on competition charger, the Millennium must be hooked up to a DC power source such as a power supply or a lead-acid battery. According to Novak, an onboard power supply would make the Millennium larger and heavier (no argument here) and would not offer the same "clean" DC voltage you get from a switched, stand-alone power supply. I'll add that, in my experience, racers who are sophisticated enough to require and exploit the Millennium's capabilities already own a power supply—so there.

## OPERATION

- **LCD display.** Suitably powered, the Millennium's LCD screen lights up with a subtle green glow. From the angle at which I was viewing the screen, the LCD characters looked faint, but a quick twist of the viewing angle adjustment pot brought them into sharp contrast.

- **Control buttons.** Four buttons on the unit's face control the Millennium's functions. The up and down arrow keys cycle the display through different menus. The Enter button calls up the information selected by the arrow keys, and Back takes you out of the function that Enter put you into; it's simple stuff.

- **Menus.** The Millennium's Select Menu includes the following option screens: Charge Mode; View Charge Info; Volt Threshold; Button Tone; Alarm Tone. Selecting Button Tone and Alarm Tone allow you to adjust the pitch of the alarm and the "beep" heard with each button press.

The other functions operate as follows:

- **Charge mode.** There are three modes to choose from: Ni-Cd Linear, Ni-Cd Rev Pulse and NiMH.

—Ni-Cd Linear is "straight charging," with a trickle-charge option after peak charging has been completed. The linear charge amperage may be adjusted from 0.5 to 7.0 amps in 0.1 amp increments, and the trickle-charge amperage may be set for 0.1 to 0.4 amp.

—Ni-Cd Rev Pulse delivers a short discharge pulse once per second (pulse duration is adjustable from 5 to 20 milliseconds). According to Novak, the reverse pulses help reduce the batteries' internal resistance, thereby increasing the pack's average discharge voltage. As with linear charge mode, the reverse pulse mode's amperage is adjustable from 0.5 to 7 amps, but there is no trickle-charge option.

—NiMH mode allows the Millennium to charge those fancy nickel-metal-hydrides in your transmitter (you switched over from Ni-Cds, right?). The Millennium limits amperage to 0.5 to 1.5

amps for safe charging. Novak warns that you shouldn't use Ni-Cd charge modes with NiMH batteries.

- **View charge info.** The Millennium automatically displays the "charge info" after charging has been completed. If you cycle to the view charge info screen before charging a pack or after the unit has been switched off ("unpowered" would be more accurate; there is no "off" switch!), the Millennium will display the data obtained from the last charged pack. The info screen displays peak voltage, charge time (in seconds), capacity (in milli-amp hours) and pack energy measured in joules (1 joule is equal to the work done when 1 amp is passed through a load of 1 ohm for 1 second).



*The Millennium in action. It makes a good photo, but there's no need to keep the car and power supply this close to the charger. Its long battery and power-supply leads combined and small "footprint" make it easy to put the Millennium in a convenient spot.*

- **Volt threshold.** The Millennium is a "delta peak" charger; delta is the Greek sign for change, and delta peak chargers look for a drop (change) in voltage. The Millennium allows you to adjust the amount of voltage drop (in millivolts) the charger will require to indicate that the pack has peaked. The value may be adjusted from 8 to 20 millivolts per cell. At this point, you might be thinking, "That's great, but how do I know what a good setting is?" Don't worry; Novak includes recommended settings and user tips for the various functions. The Millennium also remembers all your settings; there's no need to reprogram it for each pack or after shut-down.

## USING THE MILLENNIUM

The Millennium is a high-tech piece of gear, but it's simple to use. Once powered up, Start is displayed; just hit Enter to begin charging. You'll notice a pause; before spooling up its internal cooling fan and getting down to work, the unit analyzes the pack to determine its condition. You might find that the Millennium starts some of your ratty practice packs on trickle-charge. According to Novak, the

Millennium does this if it determines that individual cell voltages need to be brought up to avoid cell reversal or other problems.

While the pack is charging, the LCD screen cycles through three screens of charge data:

- charge time and pack voltage (displayed continuously);
- number of cells charging and delta-peak value;
- charge mode and charge current.

When charging has been completed, an alarm sounds, and all your critical data is displayed automatically. If a problem arises during charging, the Millennium will let you know via an error message; from a simple "Battery Not Connected" to "Charger Shutoff Due to Overheat," you'll be kept up to speed.

## DOES IT WORK?

In a word, yes. I haven't had the Millennium for long (hey, I just couldn't wait to show it to you!), but I have charged packs on it daily. It just runs and runs, and the built-in fan keeps it cool. The fan's intake is on the bottom of the unit, however, so heed Novak's advice, and be careful when putting on a towel. The tallish rubber feet provide good clearance, but watch those especially plush towels. I haven't performed any scientific experiments with a "control" pack, but I have noticed improved performance from my older packs when using the Ni-Cd Rev Pulse mode.

Overall, I'm very impressed with the Millennium. Potential buyers who are moving up from an AC-powered unit will have the extra expense of a power supply to consider, but that's the only downside I can see to Novak's latest creation. If you just want to dump some juice into a pack to go out and play, the Millennium does it at the touch of a button; conversely, if you want to condition your best A-main pack and need all the data you can get, the Millennium is there for you.

\* Addresses are listed alphabetically in the Index of Manufacturers on page 209. ■



# PRODUCT watch

Need to know what's new? What works well and what doesn't? This section is devoted to objective reviews of all R/C car accessory items. From gears and wrenches to motor brushes and shock springs; if you can use it with your R/C vehicle, you'll find it critiqued on these pages.



**174**  
Serpent Power Start and Power Start 90 Starter Boxes



**176**  
GM Racing Pro ESC



**178**  
HUDY Tools



**180**  
Pro-Line Road Rage Buggy Tires

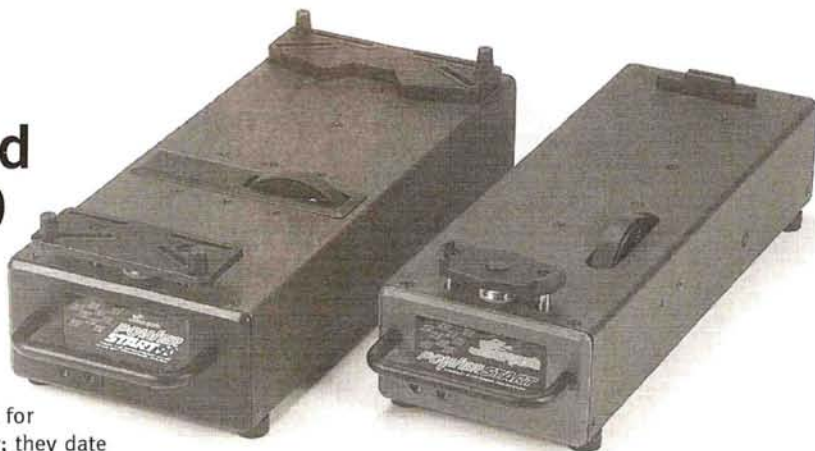
## SERPENT Power Start and Power Start 90 Starter Boxes Hot boxes

**S**tarter boxes have been around for more than a quarter of a century; they date back almost as far as nitro-powered R/C cars. In the old days, starter boxes were often crude, home-made devices that had been assembled by enterprising R/C enthusiasts who sought a better way to get their engines started. A few small companies eventually made production starter boxes, but they were rather unwieldy and required a 12V lead/acid battery for power. Not until recently did the tremendous growth in the popularity of nitro power usher in some new starter boxes.

Serpent\*, a company long known for producing some of the world's best nitro-powered 1/8 and 1/10 on-road cars, recently released a pair of starter boxes that will be welcomed by the non-pull-start crowd. The Power Start and the Power Start 90 both take starter-box technology to a new level. Unlike the boxes of old that required the user to lug around a 12V battery, the Power Start boxes are designed to be self-contained. Some other starter boxes have an onboard battery, but the Power Start boxes take the concept of self-containment one step further by using readily available Ni-Cd batteries for power rather than a gel-cell or a lead/acid battery.

Both Power Starts have a belt-driven starter wheel that is powered by two closed-endbell 540 motors. Each takes two 6-cell batteries using Tamiya-style connectors, though 7-cell battery packs could fit the space with some creative pack configuration. The boxes have a convenient handle, so it's easy to carry them to and from the pits when you're nitro racing. Each accommodates an optional Serpent Glowtronic glow-plug igniter that draws power from the main battery packs and reduces the voltage to a safe level for glow-plug ignition. A simple glow adapter is all that's needed to make the Power Start boxes entirely self-contained.

The Power Start 90 will suit any application with an in-line-mounted engine—a configuration that's popular in 1/8 off-road cars (engine facing front or rear). It comes standard with universal adapters that will fit almost any car. The universal adapters require more setup effort than the optional purpose-built adapters, but in the



long run, they will be cheaper than buying separate adapters for each car. The starter wheel in the Power Start 90 can be switched from side to side, which makes it useful for cars with engines on the left and on the right.



**Above: two 6-cell Trinity Amp Max II stick packs fit snugly inside the box. With the supplied motors, they provided enough power to start our test car all day. Left: the optional Glowtronic unit shown here allows you to hook a glow igniter up to the main battery to make the box all you need to get your nitro vehicle running.**

The Power Start is slightly smaller but packs the same punch as the Power Start 90. The standard unit is for cars that have sideways-mounted (transverse) engines—a popular configuration for nitro-powered touring cars, off-road trucks and 1/10 and 1/8 on-road cars. It comes standard with adapters designed for the Serpent 1/10 Impact and 1/8 Vector on-road cars, but it, too, can be

switched to the optional universal adapters. Adapters available for both Serpent boxes include those for Serpent 1/10 and 1/8 on-road cars, Team Associated RC10GT, Team Losi GTX/NXT and universal mounts. So if the adapters that come with the starter box don't suit your application, others will. The folks at Serpent say they are considering making adapters for the popular HPI Nitro RS4 line of cars, so if you own one of these and would like to see adapters made for it, let Serpent know you think it's a great idea.

In my experience, Serpent's Power Start boxes are everything they're claimed to be—very compact, portable and self-contained. The Power Start packs enough punch to kick over all but the most stubborn engines—usually a brand-new engine that needs some break-in. If you're in the market to make your life a little less complicated, but you still want the performance of a non-pull-start engine (if a pull-start is even available for

your application), the Power Start boxes should be on your shortlist.

—Steve Pond

Prices and part nos.—\$149.95 (Power Start/Power Start 90), 1400/1500; \$49.95 (Glowtronic), 1396.

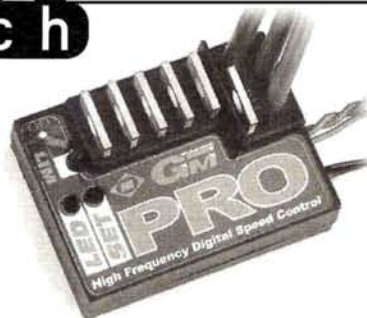
### LIKES

- Compact.
- Self-contained.
- Power provided by readily available Ni-Cd batteries.
- Optional glow driver.

### DISLIKES

- Could use a little more power for really stubborn engines.





## GM RACING

## Pro ESC

### A Pro-grammable racing controller

The GM Racing\* Pro surprised me as soon as I opened its manual; I knew GM's top racing model, the V-12, offered user-programmable performance parameters, but I had no idea the same adjustability had been built into the "Pro" ESC. Given the Pro's conventional-looking case and FET arrangement, I assumed it would merely be another competent racing controller with a current limiter. It is those things, of course, but it also offers much more.

#### FEATURES

The Pro's current limiter is its most obvious feature; the adjustment knob is sticking out of the case in plain sight. Likewise, the recessed Quick Tune setup button is easy to spot. (Remember when there were pots for high throttle and neutral? Uh, me neither.)

*Here's what else the Pro has to offer:*

- **Turbo mode.** It's not what you think. "Turbo" allows the Pro to deliver full power even when the current limiter is set at its lowest setting. The function is programmed for a user-selected time limit (0.27, 0.55, 1.1 or 2.2 seconds), during which the current-limiter adjustment is in effect. After the selected time has elapsed, the current limiter is switched off for full-power operation—but only until the trigger returns to neutral; then the Turbo function is reactivated, and the process begins again. The default value is 2.2 seconds.
- **Minimum brake.** The Pro allows you to choose the minimum brake setting in 10-percent increments of maximum brake (100 percent). The default value is zero.
- **Maximum brake.** You guessed it; this adjustment controls how much brake there is with full up-trigger and is also set in 10-percent increments. Default is 100 percent.
- **Automatic brake.** This is GM parlance for drag brake. When activated, the auto-brake function applies the minimum brake setting when the trigger is at neutral. Auto brake is disabled as the default setting.
- **Frequency.** The Pro's operating frequency may be set for 2000 or 4000Hz (2000Hz default).
- **Quick start.** This function disables the current-limiter setting until the first application of full throttle; thereafter, the current-limiter setting is activated.

#### PROGRAMMING THE PRO

The Pro is easily matched to the receiver via the Quick Tune button, but programming the various adjustable functions requires a lot of patience; the instructions' vague programming section is part of the trouble,

#### MANUFACTURER SPECIFICATIONS

On-resistance: 0.002 ohm  
Max. constant amp load: 40  
Frequency: 2000/4000kHz  
Current limiter?: Yes  
Motor limit: none  
Case dimensions: 15x32x43mm (0.59x1.25x1.69 in.)  
Weight w/wires: 50.6g  
Includes: Schottky diode; JR and Futaba (installed) receiver plugs; pot adjustment/push-button tool; decal sheet; instructions.

although the manual is otherwise clear.

Here's how it works:

- Put the Pro into programming mode by switching it on while depressing the Quick Tune (QT) button.
- Select the function you wish to adjust by pressing the QT button; one push takes you to the first function; two takes you to the second, and so on.
- Once you're at the function you need, the ESC beeps three times to indicate it is ready for you to adjust the function.
- Each press of the QT bumps up the value of the function you're setting; for example, when you're setting minimum brake, each press of the QT button adds another 10 percent to the function's value. Two presses add 20 percent; five add 50 percent; you get the idea.

It gets more complex. The frequency, Quick Start (QS), and Automatic Brake (AB) functions are linked and cannot be adjusted or enabled individually. Every combination of 2000/4000kHz, QS on/off and AB on/off is available as a preprogrammed "set," but it takes patience to count button presses. As you might expect, the manual is indispensable, since it is the only key to the sequence of adjustable parameters.

#### PERFORMANCE

I found the Pro's default settings perfectly acceptable for the RS4 Pro I tested it in, but naturally, I wanted to try its adjustable features. The utility of each depends on the individual user, but I found the adjustable frequency helpful (I chose 4000kHz to help flatten power delivery on tight tracks), and the drag brake made it easy to brake for turns when low traction made my not-so-sensitive trigger finger too imprecise for consistent cornering under braking. I would like to see heat sinks included with the Pro, since the FET tabs do warm up, but it's nothing life-threatening. In all, it's a solid performer that offers quite a bit of tuning flexibility to the patient racer.

—Peter Vieira

#### LIKES

- Highly adjustable.
- Reliable performance.

#### DISLIKES

- Programming requires patience.
- Otherwise helpful manual is spotty where it needs to be most detailed.
- Heat sinks not included.



## HUDY Tools

### Pro tools for your pro car

**"T**he right tool for the job." This is the mantra of all working professionals who rely on tools to make a living. They recognize quality and utility and will frequently seek out tools that are better than the garden-variety Acme-esque implements you'll find at the local hardware store. Though many of these tools carry an impressive lifetime warranty/guarantee, they aren't very useful when they're broken and can't be immediately replaced (a broken tool with a guarantee is still a broken tool!).

As one of the *Car Action* staff, I've seen just about every tool for the building and maintaining of R/C cars. I've used these tools on hundreds of kits, and that has to make me one of the most experienced "tool people" in the business. An increasing number of high-quality tools are available to R/C enthusiasts, but until now, we really haven't had what I consider to be the "ultimate" tools.

Serpent USA\* has just introduced, at least in the U.S., Hudy Special Tools—a new line of hand tools that are the best I've seen. They're available in all of the most common standard and metric sizes that are used in R/C cars.



**A full set of these tools in your pit box will definitely make your R/C buddies jealous. assistant editor Greg Vogel is always hanging around my pits trying sponge a Hudy screwdriver or an Allen wrench.**

The construction of the Hudy tools starts with an aluminum handle that comes in three sizes:

- *small*—for small Allen wrenches. Using the smaller handle on the smaller tools minimizes the torque that can be applied, and that reduces the chance of stripping Allen screws and slotted screws;
- *medium* for larger Allen wrenches and screwdrivers;
- *large*—for the largest of the tools. Larger handles are used with the tools intended for larger, stronger fasteners.

Each of the handles has stripes that show the size of the wrench. Broad stripes (sometimes plus a narrow one) identify metric

wrenches: each broad stripe signifies 1mm, and each narrow stripe indicates 0.5mm; for example, a handle showing three broad stripes is on a 3mm wrench; two broad stripes and one narrow stripe show it's a 2.5mm wrench.

The standard wrenches are identified differently because their size increments aren't uniform: they have only narrow stripes; the smallest—the 0.035—has one stripe, and each size up from that has an additional stripe (the largest has the most stripes).

Another unique characteristic of the handles is that they are hollow, so they're lighter. (Most R/C tools have solid handles, and when you have a complete set as large as the set offered by Hudy, it adds many pounds to the weight of your toolbox.) The handles are also knurled to allow a positive grip when your hands are covered with shock oil or anything else that would otherwise compromise your grip.

The tools' precision-ground, high-carbon, tool-steel tips (not the traditional carbide) are another strong point. Carbide is very strong, but it's also very brittle, and it isn't as difficult as you might think to snap the tip off a carbide tool. The high-carbon steel used for the Hudy tools is just as strong but not as brittle, so it's less likely to break at a critical moment (that's when tools always break). The replaceable tips are all available in three lengths—33, 60 and 120mm—which can be ideal for custom-fitting the tools to your toolbox. If fitting them into your toolbox isn't an issue, the longer shafts can be ordered for the smaller wrenches. A longer shaft allows more torsional "give," and that helps you avoid stripping the smaller, more delicate fasteners.

Holding the tip in the handle is a large (4mm) setscrew that has a flat spot ground into its shaft to prevent it from slipping (some of the smaller setscrews found in other tools don't have this feature).

The icing on the cake is that for a nominal charge, Hudy will engrave the tool handles with your name (or anything you'd like, within reasonable limits) opposite the Hudy name. To avoid duplication, your name then goes into a database (which can be accessed through Hudy's website), making your tools truly unique.

As you'd expect with products of this caliber, the Hudy tools carry a higher price tag, but if you consider yourself a serious R/C enthusiast and enjoy the rewards of having the best, then you're looking in the right place! —Steve Pond

**Prices—\$11.95** (Allen and ball drivers; replacement tips—\$7.95), **\$12.95** (screwdrivers), **\$24.95** (reamer).



**The ends of the Hudy tools' high-grip handles have stripes that show the tools' sizes. For a nominal sum, you can make your tools unique by having your name engraved on the handles.**

### Sizes and part nos.

#### ■ Allen wrenches

- 1.5x30mm—part no. 11 1510
- 1.5x60mm—11 1520
- 1.5 x120mm—11 1540
- 2x30mm—11 2010
- 2x60mm—11 2020
- 2 x120mm—11 2040
- 2.5x30mm—11 2510
- 2.5x60mm—11 2520
- 2.5 x120mm—11 2540
- 3x30mm—11 3010
- 3x60mm—11 3020
- 3 x120mm—11 3040
- 4x30mm—11 4010
- 4x60mm—11 4020
- 4 x120mm—11 4040
- 5x30mm—11 5010
- 5x60mm—11 5020
- 5 x120mm—11 5040
- 0.035x30mm—12 3510
- 0.035x60mm—12 3520
- 0.035 x120mm—12 3540
- 0.050x30mm—12 5010
- 0.050x60mm—12 5020
- 0.050 x120mm—12 5040
- 0.063x30mm—12 6310
- 0.063x60mm—12 6320
- 0.063 x120mm—12 6340
- 0.078x30mm—12 7810
- 0.078x60mm—12 7820
- 0.078 x120mm—12 7840
- 0.093x30mm—12 9310
- 0.093x60mm—12 9320
- 0.093 x120mm—12 9340

#### ■ Ball drivers

- 2x120mm—13 2040
- 2.5x120mm—13 2540
- 3x120mm—13 3040
- 4x120mm—13 4040
- 5x120mm—13 5040
- 0.078x120mm—13 7840
- 0.093x120mm—13 9340

#### ■ Screwdrivers

- 3x120mm—15 3040
- 3x120mm—15 3050
- 4x120mm—15 4040
- 4mm (for engine adjustment)—15 4050
- 5x120mm—15 5040
- 5x150mm—15 5050
- 4x120mm (Phillips-head)—16 4040
- 5.8x120mm (Phillips-head)—16 5840
- For engine head—15 5830/15 5800



# Team ORION MOTOR TECH

with Oscar Jansen

## PART 7

## More on brushes

We pick up where we left off last month.

### Timed brushes

A "timed" brush has been cut to increase timing in fixed-endbell motors that otherwise have no timing adjustment. Timed brushes will increase rpm and power. They should not, however, be used in motors whose timing may be advanced by rotating the endbell, as there is no advantage to having timed brushes in these applications; in fact, the timed brush's smaller surface area will inhibit motor performance.

### Additional tips to consider when running timed brushes:

- Soft springs are not recommended. The timed brush has less surface area, and a soft spring will not keep the brush in full contact with the comm.
- Medium springs will work well; a 150-degree spring may be used with high-silver-content brushes to avoid brush bounce and arcing.
- Hard springs will work fine to increase punch, but you'll notice a big loss of rpm!

### Other types of brush

I have detailed the most used brush faces; there are more types, but most do not offer any real advantages, and many hinder performance more than they help. I suggest you use the previously mentioned types, as they will work in every situation if used with the correct gear ratio and suitable springs.

### Interpreting brush wear

If you check the brush after each run, you'll learn a lot about the condition—good or bad—of your motor or car. You'll even be able to see gear-ratio problems. In general, if a new brush changes color, you know it has been overheated; overgearing is usually the cause. The brush should always have its original color and a nice shiny surface.

If the brush has not changed color but its surface looks black or a little burned, you should use a slightly stiffer spring for your motor. If you do not want to do this, be sure to clean the brush and comm regularly with a comm stick and motor spray.

Finally, check the brush length often. Spring tension decreases as the brushes shorten with wear, and that leads to increased arcing and problems with brush bounce.

I hope this information will help you determine where you can make improvements to go faster, as that's what we're all working for!

# PRODUCT watch

## PRO-LINE

## Road Rage Buggy Tires Street meats



**E**ven though racing buggies are explicitly for off-road use, most will see action on pavement sooner or later. Sometimes, you need a consistent surface to set your car's slipper clutch or ball diff, and dirt simply isn't available; or maybe you just want to fool around in a parking lot for a change of pace. No matter what you have in mind, today's soft off-road racing rubber won't last long even on the smoothest pavement. So where are the blacktop tires for buggies?

Pro-Line's\* new Road Rage treads are the hot ticket. They're closely patterned after full-scale, road-going rubber and certainly add a high-performance look to 2WD and 4WD Losi, Associated, Kyosho and Tamiya buggies (with 2.2 wheels, of course). The Raggers look even meaner when a buggy is "slammed"—like my Associated RC10B3 shown here. The rear tires are a direct fit, but 2WD buggies need a set of Pro-Line's wide front wheels to accommodate the 4WD-width front rubber. Foam inserts are included with the M2-compound tires.



To test the Road Rage tires, I glued a set to the appropriate rims and bolted some silly horsepower into my B3. How silly? Try a 10x2 Trinity D3. I also installed HPI's 2-speed B3 top-shaft assembly. Hey, if I'm going to run on pavement, I want to go fast! I burned off a few packs on blistering, straight-line speed runs, and the Road Rage tires put down the horsepower well. Traction was consistent and grippy when cornering as well, and the Road Rage tires easily surpassed the B3's dubious on-road abilities. Add some pavement-appropriate suspension tuning, and I bet my buggy could tear up a touring-car track fairly well!

I'm not sure I'll commit myself to an on-road buggy project, but I will definitely keep my Road Rage tires handy for high-speed goofing around and any tuning sessions away from the dirt. They look awesome, perform well and expand the possibilities for buggy fun.

—Peter Vieira

\*Addresses are listed alphabetically in the Index of Manufacturers on page 209.

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# PRO-LINE

# Track Directory

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## YOUR 1999 TRACK GUIDE



### ALABAMA

Beacon Point RC Raceway, 15717 Beacon Point Drive, Tuscaloosa, AL 35406; Don, (205) 333-8679

Hobbytown USA Raceway, 450-Q Schillinger Rd. N., Mobile, AL 36608; Rob & Kari Baker, (334) 633-8446

Lagoon Park R/C Raceway, 2730 Lagoon Park Dr., Montgomery, AL 36109; Alex Love, (334) 272-6438

Phenix Raceway & Hobby, 2006 Opel Rd., Phenix City, AL 36867; Chris Watson, (334) 298-9786; <http://www.xoom.com/PhenixHobby>

R/C Hi-Tech Raceway, 3303 Meridian St., Huntsville, AL 35811; Rick Chambers, (205) 539-1347

R/C Thunder Tracks, 1530 Schillinger Rd., Mobile, AL 36675; for mail, use 8125-2 Moffett Rd., Semmes, AL 36575; Jerry Hurst, (334) 645-2787

### ALASKA

Fairbanks R/C Car Club 510 Juneau Ave., Fairbanks, AK 99701; Dan Anderson, (907) 456-5494

### ARIZONA

HobbyTown Mountain Raceway, 1500 E. Cedar Ave., Cedar Hills Shopping Center, Flagstaff, AZ 86004; Richard, (520) 214-9887

HobbyTown Raceway, 13802 N. Scottsdale Rd., Scottsdale, AZ 85250; (602) 948-3946

HobbyTown Raceway, 1915 East Baseline Rd., Gilbert, AZ 95234; Dennis, (602) 892-0405

HobbyTown Raceway, 1102 E. 22nd St., Tucson, AZ 85704; (520) 882-8888

HobbyTown U.S.A., 5030 E. Ray Rd., Phoenix, AZ 85044; Linda McFarland, (602) 598-5282

Kiwanis Park R/C Raceway, 855 Magnolia Ave., Yuma, AZ 85364; Jim Liggett, (520) 539-7148

Quarter Flash'n Squirtin' Dirt Raceway, 16301 S. Santa Rita #C, Sahuarita, AZ 85629; Dave, (520) 625-9274

R/C Sports Mania, 3550 N. 35th Ave., Phoenix, AZ 85017; Brian Dick, (602) 278-3671

Scottsdale R/C Raceway, 3023 N. Scottsdale, Scottsdale, AZ 85251; Scott Anfinson, (602) 945-2186

Speedway Hobbies, 2710 N. Steve's Blvd., Ste. 8, Flagstaff, AZ 86004; Gary McAllister, (520) 714-1566

### ARKANSAS

Arkansas R/C Car Association, 101 W. 52nd St., N. Little Rock, AR 72118; William Byrd, (501) 753-1286

Airport Speedway, 1521 Airport Loop, Rogers, AR, 72756; Mike Dollar, (501) 636-7123

Grand Slam Superspeedway, 5300 S. Zero St., Ft. Smith, AR 72901; Bryon Shumate, (501) 648-1994

Hobby Town USA, 356 E. Joyce, Fayetteville, AR 72703; Darrell Irvin, (501) 571-3730

Sparks R.C. Raceway, 7194 Greene 721 Rd., Paragould, AR 72450; Tommy Sparks, (501) 239-3606

### CALIFORNIA

Castle Hobbies, 14918 Camden Ave., San Jose, CA 95124; (408) 377-3771

Hobby Central Raceway, 34255 P.C.H., Unit 107, Dana Point, CA 92629; John, (619) 513-0373

Hobby Central II Raceway, 13461 Community Road, Poway, CA 92064; John, (619) 513-0373

HobbyTown, Parktown Plaza Shopping Center, 1350 S. Park Victoria Dr. #21, Milpitas, CA 95035; (408) 945-6524

Hobby Warehouse, 8950 Osage, Sacramento, CA 95828; Roger Hubbard, (916) 381-7587

Hot Rod Hobbies, 25845 San Fernando Rd., #21, San Luis Obispo, CA 93150; Rod Weisbaum, (805) 255-2404

Jake's Performance Hobbies, 6650 Commerce Blvd. #21, Rohnert Park, CA 94928; Jake, (707) 586-3375

Just for Fun R/C Raceway, 509 S. State St., Ukiah, CA 95482; Don, (707) 462-7305

Lucerne Valley Raceway, 32800 Old Woman Springs Rd. #4, P.O. Box 2047, Lucerne Valley, CA 92356; Frank Rodrigue, (760) 248-7305

M n M Hobbies, 4225 Prado Rd., Ste. 103, Corona, CA 91720; Joe Stanovich, (909) 272-3545

Nor-Cal Mini-Speedway, 519 Bush St., Woodland, CA 95695; Steve Van Atta, (530) 668-5678

Racer's Haven Raceway, 7401 White Lane #12, Bakersfield, CA 93309; Martin Buchanan (805) 835-0441

Radio Control Products, 201 E. Magnolia Blvd. #148, Burbank, CA 91502; Tab, (815) 846-4208

Rams 1/8-scale Gas and 1/16-scale Gas On-Road, Mission College, Lot B, 3000 Mission College Blvd., Santa Clara, CA 95054-1897; Steve Tsuruda, (415) 675-5609

Ripon R/C Speedway, 701 N. Acadia Ave., Ripon, CA 95366; Dan Tanis, (209) 599-5160

Showtime R/C Speedway, 3709 Abbott Dr., Bakersfield, CA 93312; Grant or Karen Kniffen (805) 589-0493

Simi Valley Groundpounders, 392 C - East Easy St., Simi Valley, CA 93065; Jack Kasten, (805) 584-8211

So. Cal R/C Raceway, 19118 Brookhurst St., Huntington Beach, CA 92646; Jim Blauvelt, (714) 963-7484

Team Air Racing Club, 18208 Imperial Hwy., Yorba Linda, CA 92686; Don or Nicky, (714) 579-7488

Track Heaven, 6196 Child's Ave., San Diego, CA 92139; Loure, 475-2020

Tri-Valley Auto Racers, Livermore Elks Club, 940 Larkspur, Livermore, CA 94550; Mike Stone, (510) 455-6833

Ultimate Hobbies, 2378 North Orange Mall, Orange, CA 92665; Cliff Murukami, (714) 921-0424

Valley R/C Racepark, 146 S. Santa Fe St., Hemet, CA 92344; Valley Wide Recreation, (909) 925-9331 or (909) 654-1505

### COLORADO

MHOR R/C Raceway, 15540 East Batavia Dr., Aurora, CO 80011; Jess Brockman, (303) 343-0151

S&T R/C Raceway, 323 Auburn Dr., Colorado Springs, CO 80909; Tim Bishop, (719) 574-2910

Valley West R/C Club, 2202 I Road, Grand Junction, CO 81505; Waymond Williams, (970) 242-8846

### CONNECTICUT

Central CT Auto Racers, Davis Hobbies II, 45A Welles Street, Glastonbury, CT 06033; (860) 633-3056

East Lyme R/C Kar Klub, Society Rd., East Lyme, CT 06333; Howard Estorm (203) 483-9201

K/N R/C Speedway Inc., West St., Stafford Springs, CT 06076; for mail, 44 Clearview Rd., Moodus, CT 06469; (860) 684-9896

Racing and Entertainment Center, 29 Olcott St., Manchester, CT 06040; Peter Tierlini, (860) 643-4768

R/C Madness, 640 Enfield St., P.O. Box 64, Enfield, CT 06082; Christopher Marcy, (860) 741-6501

Xtreme Radio Control, 469 Danbury Rd., New Milford, CT 06776; Paul or Pete, (860) 354-4703

### DELAWARE

DARCAR Club, Blue Hen Corporate Center, Rte. 113, Dover, DE, 19901 Steve, (302) 697-8350

Eastcoast Off-Road, Rt. 3 Box 256 A, Laurel, DE 19956; Darrin Shockley or Steve Nelson, (302) 875-8160

The Hobby Outlet: Tracks of the Outlet, Salisbury Rd., Dover, DE 19901; Steve, (302) 697-8350

Hobby Stop Speedway, RD4, Box 100, Rte. 13, Seaford, DE 19973; Remy Haynes, Jr., (302) 629-3944

### FLORIDA

B-T R/C Central, 811 Playground Rd., Ft. Walton Beach, FL 32547; (850) 863-1666

Brantford R/C Speedway, Rt. 3, Box 240, Brantford, FL 32008; (904) 935-0758

Broward County R/C Race Club, Mills Pond Park, Ft. Lauderdale, FL; Ed Decembero, (954) 525-3304

Burton's R/C Raceway, 4215 Mustang Rd., Lakeland, FL 33803; Louie Burton, (941) 685-1322

Coral Springs Roadrunners, P.O. Box 9632, Coral Springs, FL 33075; John Argenteo, (954) 925-8284

Farmer's Hobby Shop & Raceway, 5006-3 E. Broadway, Tampa, FL 33619; Greg Cardone, (813) 248-3314

First Coast Speedway, 6410 Waltho Dr., Jacksonville, FL 32211; Bob Thompson, (904) 743-2161

5-Fifty-5 R/C Raceway, State Road 555, Bartow, FL 33830; Henry Haacke (941) 533-0539

Frontier Race Track, 15260 N.E. 244th Ave., Salt Springs, FL 32134; Harold Reel, (352) 685-2881

Gainesville R/C Speedway, P.O. Box 693, Melrose, FL 32666; 130 NW 14th Ave., Gainesville, FL 32601; (352) 495-3600

G & C Hobby Raceway, 1228 Hypoluxo Rd., Lantana, FL 33462; George, 561-547-3812

### Key to Symbols

- Indoor
- Outdoor
- Off-road
- Oval
- Dirt oval
- Carpet
- Concrete
- Asphalt
- On-site hobby shop
- AC power
- Auto lap-counting
- Food available

Greater Orlando Auto Racers, 970 Keller Rd., Altamonte Springs, FL 32714; Rob Michael, (407) 834-9299

Hobby World Raceway, 7273 103rd St., Jacksonville, FL 32210; Greg, (904) 772-9022

The Hobby Stop Raceway, 5765 Manatee Ave. W., Bradenton, FL 34209; Rich Konnen, (941) 798-9638

The Hobby Stop Raceway, 2454 Land O'Lakes Blvd., Land O'Lakes, FL 34639; Rich Konnen, (813) 948-0606

Minnreg R.C. Club, 6340 126th Ave. N., Clearwater, FL 34624; David Fox, (813) 787-6032

Monster Hobbies, 616 Southeast 10th St., Deerfield Beach, FL 23441; (904) 428-9118

Morris Kohl's Raceway and Hobby Shop, 1202 W. Waters Ave., Tampa, FL 33604; Morris Kohl, (813) 931-1626

My Rose, 1695 W. Indiantown Rd., Jupiter, FL 33458; Mark Watson, (561) 744-3800

NORRA, 3300 Santa Barbara Blvd., Naples, FL 33999; Jerry Pecar (941) 455-9065 or Mark Benfield, (941) 263-6861

Paradise Speedway, Mile Marker 98.5 U.S. 1, P.O. Box 738, Key Largo, FL 33037; Joe Ravard, (305) 451-3707

Paul's Stadium Raceway, 4511 W. Dr. M.L. King Jr. Blvd., Tampa, FL 33614; Paul Surette, (813) 872-8662



**PBG R/C Motor Park**, 6351 Barbara St., Palm Beach Gardens, FL 33418; Doug Gleason, (561) 743-9791 or Tim Case, (561) 627-2608



**Pro Hobbies Speedway**, 715 N. Lake Pleasant Rd., Apopka, FL 32712; (407) 886-4615



**Port St. Lucie Racing**, 3626 SW Rivera St., Port St. Lucie, FL 34953; Frank Spadavecchia, (561) 336-8711



**River City R/C Car Club**, 9711 Sharing Cross Dr., Jacksonville, FL 32257; Bill Fraden, (904) 268-1948



**Sarasota RC Speedway**, 8475 Cooper Creek Blvd., University Park, FL 34201; Jim Wilson, (941) 358-7047



**Sea Coast Watercraft and Hobby**, 3119 Barrancas Ave., Pensacola, FL 32507; Vic Lakatos, (850) 457-1493



**South Daytona R/C Raceway**, 2121 S. Ridgewood Ave., South Daytona, FL 32119; Mike Bean, (904) 426-6481



**South Palm Beach Racers**, South County Regional Park, West Boca Raton, FL 33486; Mike Fazio, (561) 338-5367



**Superior Hobbies R/C Parking Lot Racing**, 430 E. Hwy. 436, Ste. #106, Casselberry, FL 32707; Rob Michael, (407) 834-9299



**Tallahassee R.C. Raceway**, Tom Brown Park, Easterwood Dr., Tallahassee, FL 32311; Roland Costine, (904) 671-2814



**Tampa Bay R/C Club**, P.O. Box 10224, St. Petersburg, FL 33733; Dick Gillette, (813) 526-0744



**Tampa Hobbytown R/C 4 Slot Car Raceway**, 15702 N. Dale Mabry, Tampa, FL 33618; Max and Judy Rosenroth, (813) 968-7233



**Tropical R/C Raceway**, Tropical Park, Miami, FL 33155; Pat Butler, (305) 772-4122



**Winterset Raceway**, U.S. Rt. 27 South, Winterset Motel, Sebring, FL 33872; John Bisbee or Mac Mixer, (941) 699-1140 or (941) 385-4448



## GEORGIA

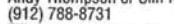
**Anthony's Victory Lane**, 129 East Hwy 80, Pooler, GA 31322; Anna Stephens, (912) 748-0847



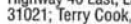
**Dalton Raceway**, 3036 Parquet Road, Dalton, GA 30720; (706) 226-6699



**EEcheconnee Superspeedway**, 2149 Richardson Dr., Macon, GA 31206; Andy Thompson or Cliff Kline, (912) 788-8731



**EWEmerald City R.C. Speedway**, Highway 40 East, East Dublin, GA, 31021; Terry Cook, (912) 272-3856



**The Flight Box Hobby Shop**, 3134-C Rockmart Rd., S.E., Rome, GA 30161-6826; Leslie Duke, (706) 234-3014



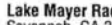
**Hobby Town Raceway**, 2301 Airport Thruway, Columbus, GA 31904; Frank Bastos, (706) 660-1793



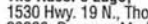
**HobbyTown Raceway**, 225-B Tom Hill, Sr. Blvd., Macon, GA 31210; Marcus Lee, (912) 474-0061



**Lake Mayer Raceway**, 1430 Dale Dr., Savannah, GA 31406; (912) 598-9709



**The Racer's Edge**, 1530 Hwy. 19 N., Thomaston, GA 30286; Roger or Mark Walls



**Sandy Cross Speedway**, Rt. 1, Box 1071, Hwy. 51, Royston, GA 30662; Morris Phillips or Wayne Fowler, (706) 245-9573



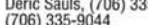
**SHILOH R/C Raceway**, 6362 Shiloh Rd., Hahira, GA 31632; Doug Burnett, (912) 794-2507



**Silver Wings Raceway**, 5611 Riverdale Rd., College Park, GA 30349; M. Bradshaw, (770) 991-2225



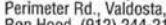
**Stinger RC Super Speedway**, 3769 Nelson Blvd., Commerce, GA 30529; Deric Sauls, (706) 335-5006 or (706) 335-9044



**Sugar Bowl R/C Speedway**, 5272 Nelson Blvd., Sugar Hill, GA 30518; Shelley Bailey, (770) 945-6709



**Valdosta Hobbies**, 3998 Inner Perimeter Rd., Valdosta, GA 31602; Ron Hood, (912) 244-2101



## HAWAII

**A.S.I. Raceway**, 4518 Akoa Rd., Kapaa, HI 96746; Arnold Morales, (808) 821-8132



**Garden Isle R/C Racers**, 5855 Ahakea St., Kapaa, Kauai, HI 96746; Arnold Morales, (808) 823-0856



**Kakaako Water Front Park Dragway**, 98-029 Hekaha St., Bay #32, Aiea, HI 96701; James Inkyo, (808) 487-5155



**Keeli Lagoon Park**, Leeward Community College, Waipahu, HI 96797; (808) 676-5486



**Maui R/C Racing Association**, 230 Hana Hwy, Unit 11, Kahului, HI 96732; Garret or John, (808) 873-0376; (808) 893-0116, or (888) 646-6687



**Pearl City Raceway**, 98-029 Hekaha St., Bay 32, Aiea, HI 96701; James Inkyo, (808) 487-5155



**Radio Control Hawaii**, 474 Kalanikoa St., S-104, Hilo, HI 96720; Glenn Shiroma, (808) 935-5629



**Team PRC Racing Club**, 176 Mamo St., Hilo, HI 96720; Charlie Kawamoto, (808) 935-3561

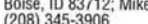


## IDAHO

**Capital Dirt Burners**, 301 N. Bruce, Boise, ID 83712; Mike Ard, (208) 345-3906



**Dirt Stuff Plus**, 5344 N. Yellowstone Hwy., Idaho Falls, ID 83401; Brian Krah, (208) 522-7576



## ILLINOIS

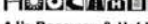
**Adam's R/C Raceway**, 7201 S. Adams, Bartonville, IL 61607; Ray Tigue, (309) 633-9300



**AJ's Raceway & Hobby**, 10211 Keslinger Road, DeKalb, IL 60115; A.J. Schultz, (815) 756-2772



**C.I.R.C.A.**, 905 Bibbs St., Jacksonville, IL 62650; Sport 'n' Hobby, (217) 245-1375



**C&R Hobbies**, 39 E. Jones, Milford, IL 60953; Ray Craighead, (815) 889-4073



**Dan's Hobby World**, 18415 S. Halsted St., Glenwood, IL 60425; Dan, Bruce or Josh, (708) 754-7988



**Gary's R/C Speedway**, 1712 East Grove, Rantoul, IL 61866; Gary Dale Flesher, (217) 893-9297



**Glenwood Roseway**, 18417 Halsted, Glenwood, IL 60425; Don's Hobby World, (708) 754-7988



**G&R Raceway & Hobbies**, 533 Bank Lane, Highwood, IL 60040; Randy Rose, (847) 432-9600



**H & H Hobbies and Raceway**, 9346 Virginia Rd., Lake in the Hills, IL 60102; Mike Hollingsworth, (847) 458-1777



**Hans' RC Race Place**, 2051 2100th St., Atlanta, IL 61723; Hans Bishop, (217) 648-2915



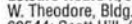
**HobbyTown Raceway**, 2103 N. Veterans Pkwy., Bloomington, IL 61701; Gary Pritts, (309) 664-4451



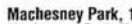
**Hopkins Hobbies**, 723 South 8th St., Century Plaza, West Dundee, IL 60118; (847) 428-9621



**Leisure Hours R/C Raceway**, 24121 W. Theodore, Bldg. 1, Plainfield, IL 60544; Scott Hill, (815) 439-1777 (track), (815) 439-1477 (shop)



**Machesney Park**, 1220 Shappert Dr., Machesney Park, IL 61115; (815) 282-1311



**Marty's R/C Hobby**, 1335 E. Broadway, Bradley, IL 60915; Gail or Marty, (815) 933-8441



**Mitey Motor Speedway**, 1109 N. Bloomington St., Rte. 23, Streator, IL 61364; Doug, (815) 672-4212



**Monroe R/C Raceway**, 26049 Ridgeland Ave., Monroe, IL 60449; Roy or Roberta Moody, (708) 534-2422 (track), (708) 799-5597 (office)



**Pontoon Raceway**, 3670 St., Rte. 111 Granite City, IL 62040-4304; Pat or Skip, (618) 931-1206



**Outlaw R/C Speedway**, 1614 Broadway, Mattoon, IL 61938; (217) 234-6229



**R/C Workshop**, 3100 S.W. Adams St., Peoria, IL 61605; Al Kretz, (309) 673-4860



**Radio-Active Raceway**, 751 N. Bolingbrook Dr., #15, Bolingbrook, IL 60440; Jim, (630) 759-7557



**Rector's R/C Raceway**, RR 3, Box 104, Albion, IL 62806; Tim Wolfe, (618) 842-9379 (M-F), (618) 446-3282 (Sun.)



**Shiloh Eagles Superspeedway**, 308 N. Virginia Ave., Belleville, IL 62220; (618) 277-6030



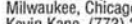
**SIRCAC Raceway**, 1200 N. Marion, Carbondale, IL 62901; (618) 549-5885



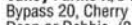
**Stanton Hobby Shop**, 4718 N. Milwaukee, Chicago, IL 60630; Kevin Kane, (773) 283-6446



**Valley Farms R/C Raceway**, 706 Bypass 20, Cherry Valley, IL 61016; Dean or Debbie, (815) 332-4516 or (815) 547-5984

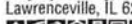


**Wep Speedway**, RR #2, Box 44 Lawrenceville, IL 62439; Bill Poe



## INDIANA

**Bremen Racing Ent.**, 308 N. Bowen, Bremen, IN 46506; Dale Heuberger, (219) 546-3807



**Elliott's R/C Raceway**, 2140 North Plate, Kokomo, IN 46901; (765) 452-0163



**GM Raceway**, 1651 W. Franklin St., Elkhart, IN 46516; Pete Russell, (219) 293-1827



**Hardesty R/C Raceway**, 11 East Plymouth St., Hamlet, IN 4653; Max Hardesty, (219) 867-8600



**Hobby Barn Raceway**, 1950 Springhill, Terre Haute, IN 47802-9694; (812) 299-5773



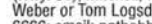
**Hobbytown U.S.A.**, 5385 E. 82nd St., Indianapolis, IN 46250; Bill Scott, (317) 845-4106



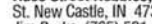
**Kokomo Hobby & Radio Raceway**, 1108 E. Markland, Kokomo, IN 46901; (765) 457-5060



**P&T Hobbies and Raceway**, RR 2 (Hwy. 60), Mitchell, IN 47446; Paul Weber or Tom Logsdon, (812) 849-6666; email: pntohobby@kiva.net



**Race Street Hobbies**, 1126 1/2 Race St., New Castle, IN 47362; Jim Burke, (765) 521-4888



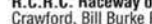
**Radio Waves Raceway**, 3677 E. CR 400 S., Connersville, IN 47331; Scott Kunkel, (765) 827-5729



**RC Barn**, 310 N 125 W, Monroe, IN 46772; Mark Lengerich, (219) 692-6600



**R.C.R.C. Raceway of Salina**, 1300 E. Crawford, Bill Burke Park, Salina, KS 67401; Calvin Calp, (913) 823-9588



**R/C World of Indiana**, 2246 West U.S. Hwy. 36, Lynn, IN 47355; Joe Kolp, (765) 874-2464; e-mail: rcworld@globalsite.net; web:www.RCWORLD.com



**R/C Mania**, 8 Wood Ct., Hebron, IN 46341; Ron Trobaugh, (219) 996-6288 (shop); (219) 762-5365



**The Rink**, 7900 Whitcomb, Merrillville, IN 46410; Don Reiner, (219) 769-8113



**Rod's Off-Road R/C Track**, 800 N. Division, Bristol, IN 46507; Rod Harms, (219) 848-7848



**Summit Area Radio Cars (SARC)**, 7000 Red Haw Dr., Fort Wayne, IN 46805; John Kissel, (219) 492-2271



## IOWA

**Delb's Speedway**, 423 11th Ave. So., Clinton, IA 52732; Rusti's Miniatures and Hobbies, (319) 243-2697



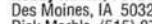
**Dubuque R/C Speedway**, Dubuque County Fairgrounds, Dubuque, IA 52001; Paul Conlon, (319) 556-2736



**Hobby Haven**, 7672 Hickman Rd., Des Moines, IA 50322; Rick Marble, (515) 276-8785



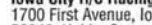
**Inside Challenge**, 2028 Main St., Keokuk, IA 52632; Jessie, (319) 524-2225



**Iowa City R/C Racing Association**, 1700 First Avenue, Iowa City, IA 52240; Hobby Corner, (319) 338-1788; fax (319) 354-6105



**IROAR—Hawkeye Downs Raceway**, Hawkeye Downs, 6th St. S.W., Cedar Rapids, IA 52404; Dave Kleinschrodt, (319) 556-8524



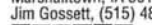
**Manly R/C Club**, Box 23 (Hwy. 65), Manly, IA 50456; Bruce Hill, (515) 454-2025



**Marble's Raceway**, 4685 SE 40 St., Des Moines, IA 50317; Rick Marble, (515) 262-7507




**Mr. Car Raceway**, P.O. Box 1112, Central Iowa Fairgrounds, Marshalltown, IA 50158; Jim Gossett, (515) 483-2234



**Outback Speedway**, 403 State St., Guthrie Center, IA 50115; Helens Enterprises, (515) 747-3064



**Pontchartrain Hobby Shop**, 3755 Pontchartrain Dr., Slidell, LA 70458; (504) 649-1199  


## MAINE

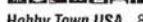
**Clay Bowl R/C Hobbies**, P.O. Box 61, Greene, ME 04236; Pat Cap, (207) 946-5003  


**R/C Speedway & Hobbies**, 87 Main St., Fairfield, ME 04963; David Prescott, (207) 453-4588  


## MARYLAND

**Cockeysville Astrodomo Racers**, 10854 York Rd. (rear), Cockeysville, MD 21030; Steve Balaz, (410) 666-2521  


**Countryside Raceway (portable)**, 406 Pamela Rd., Apt. C, Glen Burnie, MD 21061; M&J's Promotional Entertainment, (410) 761-6196  


**Doug's Raceway**, 2935 Crain Hwy., Waldorf, MD 20601; Doug Moran, Jr., (301) 843-6220  


**Hobby Town USA**, 8223-11 Elliot Rd., Easton, MD 21601; Bill Dyke, (410) 820-9308  



**J.R.'s Race Place**, 2935 Crain Hwy., Waldorf, MD 20601; James Radford, (410) 947-2766  


**Outback R/C Race Club**, Maiden Lane, Manchester, MD 21102; Randy or Bonnie Henry, (410) 374-2878  


**The Track**, 16806 Oakmont Ave., Gaithersburg, MD 20877; Mimi Wong, (301) 417-9630  


## MASSACHUSETTS


**C&C Hobby & Raceway**, 562 Russells Mills Rd., So. Dartmouth, MA 02748; Charlie, (508) 997-4131  


**Hi-Tech Hobbies**, 1681 Broadway (Rt. 138), Raynham, MA 02767; Ruben, (508) 880-5373  


**Megadrome Raceway**, Rt. 8 Curran Hwy., North Adams, MA 01247; Bob Blanchette, (413) 743-7223  


**Northboro Speedway**, 168 Main St., Rte. 20, Northboro, MA 01532; Bob Trimble, (508) 393-8087  


## MICHIGAN

**D.R. R/C**, 22789 Northline Rd., Taylor, MI 48180; Bobby or Fred, (734) 287-7405  


**Freedom Hill R/C Raceway**, 35372 Wellston, Sterling Heights, MI 48312; Curley Grewe, (810) 776-5483  


**Hobby Hub**, 5859 M99, Diamondale, MI 48821; Verne Goebble, (517) 337-9278 or (517) 351-5843  


**House of Hobbies**, 2863 West Shore Dr., Holland, MI 49424; (616) 786-3686  



**Jon's Hobby**, 4739 E. Pickard, Mt. Pleasant, MI 48858; Jon Beutler, (517) 773-5412  



**JT Superspeedway**, W. Golden Ave., Battle Creek, MI 49015; Jerry or Sam, (616) 965-0116  


**Larry's Performance R/C's**, 43665 Utica Rd., Sterling Heights, MI 48314; Larry, (810) 997-4840.  


**Lazer RC Speedway**, 2858 N. Wilmoth Hwy., Adrian, MI 49221; Russ Johnson, (517) 263-2806  


**MCRRC Raceway**, 4601 Page Ave., Michigan Center, MI 49203; Sam Sprang, (517) 787-9161  



**N.M.R.C.C. Raceway**, Hobby Toy, Main St., Gaylord, MI 49735; Ed Schneider, (517) 732-3963  


**Ovalt's R/C Speedshop**, Cheeryland Mall, 1732 S. Garfield Ave., Traverse City, MI 49686; Jim Ovalt, (616) 947-6670  


**Raw Roots Race Tracks**, 14623 East Crosswell 1/4 mile north on 152nd (off U.S. 31), West Olive, MI 49460; Roy Bennink (616) 399-9338  


**R&L Hobbies & Racing**, 9782 Portage Rd., Kalamazoo, MI 49002; Rex Simpson, (616) 323-3686; fax (616) 329-1744  


**Rodgers R/C Raceway**, 7463 Ridge Rd., Britton, MI 49229; George Rodgers, (517) 451-8301  


**Thumb Raceway**, 3441 Main St., Marlette, MI 48453; Jim Wilson, (517) 635-7848  


**Vicksburg Off-Road R/C Raceway**, 50201 Silver St., Vicksburg, MI 49097; Tim, (616) 323-7963  



**Village Hobbies-n-Crafts**, 195 N. Elm, Hesperia, MI 49421; Alan or Fran, (616) 854-1374  


**Village R/C Raceway**, Prairie Ronde St., Decatur, MI 49045; Chuck Nolke, (616) 423-7878  


**West Michigan R/C Racers Club**, 814 E. Railroad St., Hastings, MI 49058; Doug, (616) 948-2287 or Pat, (616) 945-3873  


**Willis Outdoor R/C Racetrack**, 13922 Oakville-Waltz Rd., Willis, MI 48191; Mike Higgins, (734) 587-2012  



## MINNESOTA


**Car Town USA**, 2822 Piedmont Ave., Duluth, MN 55811; Roger Deloach, (218) 727-6248  


**Duey's Hobbies & R/C Raceway**, 6600 Cahill Ave., Inver Grove Heights, MN 55076; Duey Carlson, (612) 450-1721  


**FunCity**, 9100 Park Ave., Elk River, MN 55330; (612) 441-8365  


**Grand Rapids R/C Speedway**, 2209 Hwy 2 East, Grand Rapids, MN 55744; Aaron Voges, (218) 326-6751  


**Granite City R/C Speedway**, 3555 Shadowwood Dr. N.E., East Hwy 23, Sauk Rapids, MN 56379; Brett Donahue, (320) 251-6980  


**J's Radio Control Race Park**, 22994 290th Ave., Starbuck, MN 56381; Jay Campbell (320) 239-4827  


**Northwoods Hobby Raceway**, 2638 Hwy 25 North, Brainerd, MN 56401; Tom Grogg, (218) 829-9257  



**Ray's Raceway Park**, 105 3rd Ave. NE, Glenwood, MN 56334; Dan Winter, (320) 634-5246  


**R/C Racing World**, 235 Main Ave. North, Harmony, MN 55939; Mark McKay, (507) 886-5931 or (507) 886-2224  


**Southside Speedway**, 2241 Marion Rd. SE, Rochester, MN 55904; Kevin Guy, (507) 281-3233  



**Time R/C Raceway**, 20 West Lake St., Chisholm, MN 55719; RV, (218) 254-4321  


## MISSISSIPPI

**Joe McFadden Hobbies**, 5531 Fox Meadow Dr., Meridian, MS 39307; Joe McFadden, (601) 483-7000  


**Small Cars Unlimited**, 820 Cooper Rd., Jackson, MS 39212; (601) 372-FAST; www.smallcarsunlimited.com  


## MISSOURI

**All Seasons Hobby**, 29 O'Fallon Square, O'Fallon, MO 63366; Bob Daniels, (314) 281-8767  


**B&L Hobbies & Raceway**, 2800 Anchor Dr., Park Hills, MO 63061; Bob Marler, (573) 431-9444  


**Fire Mountain Raceway**, 8647 Commercial Blvd., Pevely, MO 63070; Dan Gordon, (314) 475-6449  

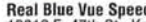

**Greentree R/C Racepark**, St. Louis Dirt Burners R/C Club, Marshall Rd., Kirkwood, MO; (314) 831-2194  


**Hobbies 'N Stuff Raceway**, 204 Mall Parkway, Wentzville, MO 63385; Tim Satchwill or Randall Olds (314) 327-6006  


**North Missouri Raceway**, 223 Graves St., Chillicothe, MO 64601; Billy Johnston, (660) 646-1120  


**Ozark Mountain Speedway**, Rt. #2 Box 50, H-Highway and County Rd. 31, Noel, MO 64854; Clayton Younker (417) 475-6222  


**Ozarks R/C Raceway**, Hwy 13N, Brighton, MO 65781; Gene Rhodes or Ron Hawkins, (417) 742-4376 or (417) 742-7223  


**Real Blue Vue Speedway**, 12019 E. 47th St., Kansas City, MO 64133; Mark Randol, (816) 358-0238  


**Real R/C Raceway**, 24204 State Rt. 58, Pleasant Hill, MO 64080; Steve Hale, (816) 540-5584  


## MONTANA

**Stormer Raceway & Slot Motorplex**, P.O. Box 126 Hwy. 2 East, Glasgow, MT 59230; (406) 228-4569  



## NEBRASKA

**Goodyear Speedway and Off-Road**, 4021 North 56th, Lincoln, NE 68510; Tom or Bob, (402) 464-5172  


**Hadar R/C Raceway**, 55192 849th Rd., Norfolk, NE 68701; John Schoenauer, (402) 644-7922  


**Hobby Town USA Raceway**, N 1st St. & Cornhusker Hwy., Lincoln, NE 68508; Ben Smith, (402) 434-5056  


**Mr. Bill's**, 450 West 2nd St., Hastings, NE 68901; Bill J. Ries, (402) 462-4865  



**O.N.R.O.A.D.**, 3307 N. 58 St., Omaha, NE 68104; Cook Jacobs, (402) 556-8674  


**OTWG Carpet Raceway**, 55129 849th Rd., Norfolk, NE 68701; John Schoenauer, (402) 644-7922  


**RC Motorsport Off-Road Raceway**, 5600 Mass Rd., Papillion (Omaha), NE 68133; Marty Stepanek, (402) 593-6133  


**Salvation Army South Corps**, 4032 Harrison St., Omaha, NE 68164; (402) 734-3414; fax (402) 734-3415  



**T & T Raceway**, 476 26th Ave., Columbus, NE 68601; Tom, (402) 564-9216  


**The Speed Zone**, 1524 Atokad Dr., South Sioux City, NE 68776; Rob Murdock, (712) 428-4679, or Jim Carson, (712) 274-7731  


**Wacha's R.C. Speedway**, 1823 23rd St., Columbus, NE 68601; Tom Smith, (402) 564-9216  


## NEVADA


**Dansey's Indoor R/C & Hobbies**, 741 N. Nellis, Las Vegas, NV; David Lugo, (702) 453-RACE, (888) 675-8963; www.danseys.com  


**Lizard Raceway**, P.O. Box 1248, Verdi, NV 89439; Jeff Griffin, (702) 345-6573  


## NEW HAMPSHIRE


**Axis Racing R/C Dragway**, 4197 High St., Exeter, NH, 03833; Dan Peterson, (603) 659-4877  


**Economy R/C Speedway**, 4 Maple St., Winchester, NH 03470; Harold Thomas, (603) 239-4482 or 239-6470  


**Robert's Railroad & Hobbies**, 1335 1st NH Turnpike—Rt.4, Northwood, NH 03261; Robert M. Jeffers, Jr., (603) 942-5193  


**RT 106 Racepark**, 743 Clough Mill Rd., Pembroke, NH 03275; Fred Farwell, (603) 224-RACE  



## NEW JERSEY

**America's Hobby Center Inc.**, 8300 Tonnelle Ave., North Bergen, NJ 07047; John Many, (201) 662-0777  



**Checkerboard Raceways**, P.O. Box 240, Elwood, NJ 08217; Ray Murray (609) 629-4809  


**Family Hobbies Raceway**, 3576 N.W. Blvd. & Weymouth Rd., Vineland, NJ 08360; Linda Vogel, (609) 696-5790  

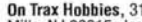

**Jackson R/C Racing**, P.O. Box 565, Christopher Columbus Blvd., Jackson, NJ 08527; Al Sodano, (732) 364-6422, or Ed, (732) 928-8963  


**Jefferson Speedway**, 5494 Berkshire Valley Rd., Oak Ridge, NJ 07438; (201) 697-7525  


**Jerry's Hobby Center & Raceway**, 336 Rt. 22W, Greenbrook, NJ 08812; Jerry or Gary, (908) 752-6030  


**LBRA Track**, 392 Warburton Pl., Long Branch, NJ 07740; (908) 222-5122  


**Millville R/C Oval**, 114 N. High St., Millville, NJ 08332; William Denstoz, (609) 327-4640  


**On Trax Hobbies**, 3101 Rte. 70, Browns Mills, NJ 08015; Joseph DiGirolamo, (609) 735-0422  



**Ray's American Raceway**, 142 Wilson Ave., Englishtown, NJ 07726; Ray Whitehead, (908) 446-3737  


**South Jersey Cost Controlled Racing**, 25 Jackson Lane, Sicklerville, NJ 08081; Ray Murray, (609) 629-4809  

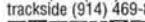

**The Race Place**, 1151 Hwy. 33, Farmingdale, NJ 07731; John Fary, (908) 938-5215  


## NEW MEXICO

**Charlie's Hobby Shop**, 225 E. Idaho, Suite 11, Las Cruces, NM 88005; Kim, (505) 541-1097  


**Meerscheidt R/C Raceway Park**, Meerscheidt Recreation Center, Walnut and Hadley by BMX, Las Cruces, NM 88005; Robert Heinzen (505) 524-6856 or Jim Meerscheidt (505) 523-2995;  


## NEW YORK

**Barnstormers Speedway**, 205 Gray Court Rd., Chester, NY 10918; Lou (914) 469-6468; trackside (914) 469-8206  


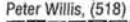
**Brownie's Pro & Sport Hobbies**, 124 Bennett St., Staten Island, NY 10302-1426; John Brown, (718) 727-2194  


**Bruckner Racing**, 2908 Bruckner Blvd., Bronx, NY 10465; Thomas Baffers Sr., (800)-288-8185  


**BSK Hobbies & Raceway**, 120 Main St., Hornell, NY 14843; Bruce Harris, (607) 324-4011, (800) 603-0197.  



**C&C Speedway**, 570 Conklin Road, Binghamton, NY 13903; Eric Boyd, (607) 773-2044  


**C&D Raceway**, 12542 NYS Rte. 12E, Chaumont, NY 13622; Chris or Don Bourquin, (315) 649-5403  


**Capital District R/C Racers**, 27 Venus Dr., Albany, NY 12211; Peter Willis, (518) 482-7128  


**Chipmunk Hill R/C Speedway**, 217 Pine St., Theresa, NY 13691; Ted or Pete House, (315) 628-5065  


**East Coast R/C Hobbies**, P.S. 186 School yard, 7601 76th St., Brooklyn, NY 11204, for mail, 2515-65th St., Brooklyn, NY 11204; Brian Cardella, (718) 627-3814  


**Foothills R/C Speedway**, 3200 Chestnut St., Oneonta, NY 13820; Dave Osterhold, (607) 432-5098  


**Frogtown Hobbies**, Rt. 37, Mini Pines Village, Hogsburg, NY 13655; Dennis White, (518) 358-3686  


**Hacr's Hobbies & Raceways**, 120 Cayuga St., Canal View Mall, Fulton, NY 13069; Jack LaTulip, (315) 598-7063  


**Jerry's Raceway**, 111 S. Applegate Rd., Ithaca, NY 14850; Jerry and Lori Achilles



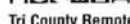
**Silver State R/C Club**, Centennial Park, Carson City, NV 89501; (702) 853-3953



**Southern Tier Raceway**, 88 Paige St., Owego, NY 13827  
Anita Harding, (607) 687-5395



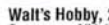
**South Shore Hobby & Raceway**, 464 East Main St., Patchogue, NY 11772;  
Benny or Bonnie, (516) 758-5567



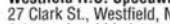
**Tri County Remote Control Car Club**, 33 West Decker St., Johnstown, NY 12095;  
Tom Leville, (518) 725-1279



**Tri-state Area Radio Control Model Auto Club (TARMAC)**, 2830 Mountain View Rd., Poughkeepsie, NY 12603; Todd (914) 342-5409; Greg (914) 528-5084; tracksite (914) 454-8276



**Walt's Hobby**, 2 Dwight Park Dr., Syracuse, NY 13209; (315) 453-2291



**Westfield R.C. Speedway**, 27 Clark St., Westfield, NY 14787;  
John or Jared Lindstrom, (716) 326-2339; 716-326-2309



**Whitestone**, 30-56 Whitestone Expy. (Dept. of Motor Vehicles), Flushing, NY 11374; Rudolf Ardilla, (718) 966-6155

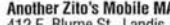


**ZOR Road Speedway**, 15318 Armes Ct., Gowanda, NY 14070; David & Gordon Ackler, (716) 532-9463



## NORTH CAROLINA

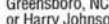
**A&J R/C Models**, 2051 Anthony Rd., Burlington, NC 27215; Jerry Loye or Andrea Thompson, (910) 227-4556; fax (910) 227-1001



**Another Zito's Mobile MASCARR Inc.**, 412 E. Blume St., Landis, NC 28088;  
Carmen Esposito or Pat Youngerman, (704) 451-3293



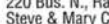
**The Antique Barn**, 2810 Forest Hills Rd., Wilson, NC 27893; (919) 237-6778



**Atlantic Coast R.C.**, 8-A Lockhead Ct., Greensboro, NC 27409; Charlie Higgins or Barry Johnson (336) 664-1277



**Badin Shore Raceway**, 1730 Jackson Lake Rd., High Point, NC 27263; Jimmy or Tim Martin, fax (910) 431-6407



**C/C Hobby Speedway**, 8358 U.S. Hwy. 220 Bus. N., Randleman, NC 27317;  
Steve & Mary Cox, (910) 495-3482



**C&H Raceway**, 1400 N. Cannon Blvd., Kannapolis, NC 28083; Camera & Hobby Shop, (704) 933-5321



**C/W R/C Speedway**, 1297 Charlotte Hwy., Asheville, NC 28730;  
Billy or Tim, (828) 684-0061



**Carolina Dragway**, 907-D Warsaw Rd., Clinton, NC 28328; (910) 592-4569



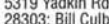
**Chatham R/C Raceway**, 326 Reno Sharpe Store Rd., Bear Creek, NC 27207;  
Dwight Fields, (919) 898-2991



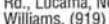
**Green Flag RC Raceway**, 107 Harley Rd., Wilmington, NC 28401;  
Mike McLemore, (910) 397-0676 or (910) 452-1620



**R & D Speedway**, 418 Main St., Tarboro, NC 27886;  
John Dupree, (919) 823-2294



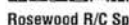
**Ride & Slide R/C Raceway**, 5319 Yarkin Rd., Fayetteville, NC 28303; Bill Culbertson, (910) 867-4202



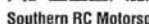
**R&J Off-Road Racing**, 6172 Blalock Rd., Lucama, NC 27851; Robert Williams, (919) 239-0853



**Radio Jockey's Parkway**, "RJ's," Rt. 9, Box 651, Fay, NC 28301;  
www.wave-net.net/mshutt  
Tony Starling, (910) 486-8050



**Rosewood R/C Speedway**, 651 Community Dr., Goldsboro, NC 27530;  
Glenn Elam, (919) 731-4734



**Southern RC Motorsports Club**, Hwy. 17S., P.O. Box 1651, Shallotte, NC 28459; Mark Whitt, (910) 754-4902 or Eddie Ferster, (910) 754-8528



## NORTH DAKOTA

**Hacienda Hills Speedway**, 20 Hacienda Hills, Minot, ND 58701;  
Kennedy Duchscherer, (701) 839-4419



**Northern Mini Racers**, 1000 36th St. SE, Minot, ND 58702;  
Mike, (701) 838-5818



**River City R/C**, 2714 Main Ave., Fargo, ND 58103;  
Chris Hughes, (701) 235-1272

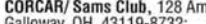


## OHIO

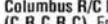
**American Ohio Sprint Car**, 1708 Empire Rd., Wickliffe, OH 44092  
Gary Waldheim, (440) 944-9966



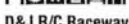
**Classic Hobbies**, 1994 E. Waterloo, Akron, OH 44312; Walt Ellis (330) 733-6400



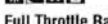
**CORCAR/Sams Club**, 128 Amity Rd., Galloway, OH 43119-8732;  
Bill Stevenson, (614) 870-7159



**Columbus R/C Racing Club (C.R.C.R.C.)**, Franklin County Fairgrounds, Hilliard, OH 43026;  
Jeff Crowell, (614) 236-1783



**D&J R/C Raceway**, 801 W. Market St., Orrville, OH 44667; Don Yoder or Mark Nussbaum, (330) 682-4266



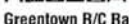
**Full Throttle Raceway**, 600 Mt. Moriah Dr., Cincinnati, OH 45255;  
Greg Roshan, (513) 943-9009



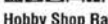
**Fun for All Raceway**, 675 College Dr., Batavia, OH 45103;  
Steve Donaldson, (513) 732-0440



**Glass City Radio Control**, 2620 Ivy Pl., Toledo, OH 43613;  
Frank Johnson, (419) 472-1286



**Greentown R/C Raceway**, 3353 Peerydale, Greentown, OH 44630;  
Chuck Lambert, (330) 364-6585



**Hobby Shop Raceway**, 2096 Miami Blvd., Centerville, OH 45459;  
The Hobby Shop, (937) 436-6161



**Hobby World**, 3499 SR 59, Ravenna, OH 44266;  
Tom Fry, fax (330) 296-0894



**Lafferty R/C Raceway**, Box 153, 70228 Hurrah St., Lafferty, OH 43951;  
Chris Christman, (614) 968-4818



**Medina R/C Raceway**, 754 N. Court St., Medina, OH 44256;  
Bill Aholt, (216) 723-0255



**Mid American Raceway**, 13150 Airport Hwy., Swanton, OH 43558  
Bill or Chuck, (419) 475-9459



**Nothing But Air R.C. Track**, 34632 True Rd., Logan, OH 43138  
Gary Lloyd, (740) 385-0288



**Scoters Hobby Hut**, 234 Robbins Ave., #D, Niles, OH 44446; Dave "Scooter" Evans, (216) 544-9411



**Shiray's Hobby & RC Raceway**, 19930 State Route 117, Waynesfield, OH 45896; Ray Zimmerman, (419) 568-8055



**TARCAR**, 7216 Nebraska Ave., Toledo, OH 43617; Bill Bridges, (419) 826-3859



**Tri-State R/C Auto Racers**, Joyce Park, Hamilton, OH, 45011;  
Ernie Bauhoffer, (513) 528-2052



**Van Wert R/C Raceway**, 144 E. Main St. (above Hoveman Music), Van Wert, OH 45891; Mark Davis, (419) 232-2112

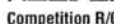


**Y-City Hobby & Speedway**, 120 S. 6th St., Zanesville, OH 43701;  
Kevin McKenna, (614) 455-3025

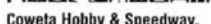


## OKLAHOMA

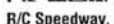
**Adams Creek R/C Speedway**, 5207 S. 194th E. Ave., Broken Arrow, OK 74014;  
John Beighle, (918) 355-1416



**Competition R/C**, 100 SE 89th, Oklahoma City, OK 73149; James or Louise Brown, (405) 634-0809



**Coweta Hobby & Speedway**, 310 S. Broadway, Coweta, OK 74429;  
Derald Seabolt, (918) 486-3948



**R/C Speedway**, 1401 N. Vanburan, Enid, OK 73701;  
Sean or Jessica Hillery, (405) 237-5504



**Remote Control Race Course**, 2600 St.-35 Serv. Rd., Moore, OK 73124;  
Rick or Steve, (405) 993-RACE



**Wild Country Speedway**, 127 South Main, Porter, OK 74454; Charles McCollough, (918) 685-0372 or (918) 687-1686

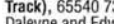


## OREGON

**Competition Racing Association**, 17941 NE Gleason, Portland, OR 97230;  
Mark Taylor, (503) 761-1334



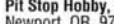
**D.I.R.T. (Diamond International Race Track)**, 65540 73rd St., Bend, OR 97701;  
Daleynne and Edward Gietz, (541) 388-2932 or 1-800-475-6040, ext. 777



**Junior Bicycle Speedways**, 3634 Table Rock Rd., Medford, OR 97501;  
(541) 664-7810



**Pit Stop Hobby**, 634 N. Coast Hwy., Newport, OR 97365;  
Richard Wood, (541) 265-2825



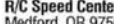
**R/C Craze Speedway**, 300 Ashland Lane, Ashland, OR 97520;  
Shawn Lazareff, (541) 482-4786



**R/C Plus Hobbies Raceway**, 185725th St. SE, Salem, OR 97302;  
Ron Smith, (503) 364-9188



**R/C Speed Center**, 2810 N. Pacific Hwy., Medford, OR 97501; Gene and Betty Jean Skelton, (541) 779-8298

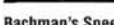


**Yamhill County R/C Car Club**, 722 Morgan Ln., McMinnville, OR 97128; Larry Rucker, (503) 472-7234



## PENNSYLVANIA

**Bachman's Speedway & Hobbies**, Box 306, Effort, PA 18330-0306; Jeffrey Bachman, (610) 681-5845



**Brookville Hobby Shop**, 170 Main St., Brookville, PA 15825;  
Mark Tonell, (814) 849-7385



**Columbia Racing Association**, 128 N. Front St., Phillipsburg, PA 16866;  
Lurch Hammal, (814) 342-7114



**Cooks Way Raceway**, Cook's Way, Mt. Pleasant, PA 16666;  
Bob Rhodes, (412) 547-5719



**Courtview Raceway**, 20 S. Main Street (lower level), Washington, PA 15301;  
Aaron Stimmell Jr., (724) 225-4302



**DC Ultra Trax**, 13 York Rd., Wycombe, PA 18974;  
David Cowan, (215) 672-5200



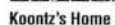
**Dreamboat Hobbies**, 2810 Pennsylvania Ave. W., Warren, PA 16365; Louie Dussia, (814) 723-8052



**Fantasy RC's and Hobby**, 2315 W. 12th St., Erie, PA 16505;  
Frank Francis, (814) 453-6337



**Hobby America Raceway**, 5 Fitzsimmons St., Duke Center, PA 16729; Dan or Mike Coast, (814) 966-3765



**Koontz's Home & Hobby Center**, 1205 Hoover St., Pittsburgh, PA 15204; (412) 331-3866



**Kranzel's R/C Raceway & Hobbies**, 415-B Bosler Ave., Lemoyne, PA 17043; David or Stuart Kranzel, (717) 737-7223



**Little Plum R/C Hobbies**, RR 1 Box 330, Lock Haven, PA 17745;  
Larry Duck, (717) 769-1984



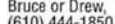
**Lugnut Raceway**, 1713 Bethlehem Pike, Hatfield, PA 19440; Bill Henning or Kathy Anderson, (215) 822-5831



**Marshall's R/C Raceway**, RR 4, Box 640, Honesdale, PA 18431; Bill or Dot Marshall, (717) 729-7458



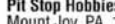
**The Mushroom Bowl**, 960 W. Cypress St., Kennett Square, PA 19348;  
Bruce or Drew, (610) 444-1850



**Pinion Twisters**, 3M Plant, Green Ln. and Mitchell, Bristol, PA 19007;  
Mark, (215) 632-2344 or Tony, (215) 742-3560



**Pit Stop Hobbies**, 262 W. Main St., Mount Joy, PA 17552;  
James Stoudt Jr., (717) 653-6222



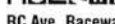
**Prop & Wheels Raceway**, 139 W. Broad St., Tamaqua, PA 18252;  
GJ Walters, Prop & Wheels Hobbies, (717) 668-2288



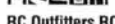
**The Raceway at River Junction**, 1216 4th St. (behind cemetery), Beaver, PA 15009; (412) 728-5571



**RC Ave. Raceway**, 324 McKinley Ave., Latrobe, PA 15650; Scott Smith, (412) 537-5501



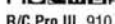
**RC Outfitters RCO Raceway**, 519 Broadway, Hanover, PA 17331;  
Chris Shaffer, (717) 633-9490



**R/C Pro Speedway**, Millville Rd., Bloomsburg, PA 17815; John Swisher, (717) 387-0266; fax (717) 387-4937



**R/C Pro III**, 910 Chestnut St., Coal Twp. (Shamokin), Shamokin, PA 17866; John Swisher, (717) 648-7763



**Riverside Raceway**, PA Ave. W & Hickory, Warren, PA 16365;  
Jeff, (814) 723-4211



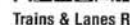
**S.A. Hi Banks**, Hahn's Dairy Rd., Palmyra, PA 18071;  
Scott Andrews, (610) 826-4583



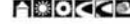
**Staub Bros. R/C Speedway**, 31 Locust St., Gettysburg, PA 17325;  
Todd or Scott Staub, (717) 334-5445



**TnT Raceway**, Randolph Rd., Great Bend, PA 18821; Frenchie, (607) 775-1750 or Ed Kraft, (717) 967-2604



**Trains & Lanes Raceway**, 3825 Northwood Ave., Easton, PA 18045;  
Jeff Setzer, (610) 253-8850, (800) 447-4891



**Willow Mill Speedway**, 37 N. Season's Dr., Dillsburg, PA 17019;  
George Verbowitz, (717) 432-4445



**Willow Run R/C Raceway**, 135 Wright St., Corry, PA 16407;  
Jim Small, (814) 664-8147



## SOUTH DAKOTA

**Action R/C Raceway,**  
107 N. Main, Mitchell, SD 57301; (605) 996-6895



**Boomerangs Raceway,**  
105 N. Main, Hartford, SD 57033;  
Ed Smithback, (605) 528-7345



**Dakota Off-Road Racers,**  
2989 W. Br. Co. 12, Aberdeen, SD 57401; (605) 226-0604



**Goldtrax Raceway,**  
409 E. High, Lead, SD 57754;  
Steve Brown, (605) 584-2355



**K&B Speedway,**  
27283 SD Hwy. #115, Harrisburg, SD 57032; Mike Kosetin,  
(605) 743-2582



**R/C Action Raceway,**  
SE Corner at 484th & Hwy. 38,  
Sioux Falls, SD 57105;  
Brian Cox, (605) 373-0511



## TENNESSEE

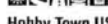
**D&M's Downtown Raceway,** 2703 U.S.  
Hwy. 411S, Maryville, TN 37603; (423) 681-8919



**Futrell's R/C Hobby Shop,** 1715 Jackson  
Ave., Seymour, TN 37865; Dan Futrell,  
(423) 908-9526



**Hillside R/C Raceway,**  
4194 Oakhill Rd., Dayton, TN 37321;  
John and Rusty Tipton, (423) 775-4739



**Hobby Town USA,**  
2000 Mallory Lane, Franklin, TN 37067;  
Bobby Mills, (615) 771-7441



**Machine-Head Strails,** 938 Grandmere  
Rd., Lawrenceburg, TN 38464; Larry and  
Eliane Sanders, (615) 762-6630



**MSA R/C Racing,** Rt. 12 Box 489 B,  
Crossville, TN 38555; D.R. Findley,  
(615) 456-0027



**Sparta Raceway Park,** 32 N. Main St.,  
Sparta, TN 38583; Carl (Buddy) Elrod,  
Rt. 5 Box #652, Sparta, TN 38583;  
(615) 836-8450 or (615) 761-3407



**TnT Raceway,** 643 Loop Hollow Rd.,  
New Tazewell, TN 37825; Cliff Swett,  
(423) 626-9065 or (423) 869-8942



**W.O.W. Raceway,** 59 Luray Rd.,  
Beech Bluff, TN 38313; Kelly Bean,  
(901) 427-7874; email:  
windix60@pipeline.com



## TEXAS

**215 Speedway,**  
1814 County Road 215, Abilene, TX 79602; Clyde Gardner,  
(915) 673-2351



**B&B R/C Hobbies,** 700 East 4th,  
Big Spring, TX 79720; Walter Bumbulis,  
(915) 263-1790



**Big Mike's R/C Raceway,**  
1405 W. Cotton St. (behind the Locker  
Room), Longview, TX 75604;  
(903) 297-7814



**Comanche Trail RC Park,**  
City Park, Big Spring, TX 79720;  
Allen Nichols, (915) 263-4241



**Discount Hobbies,** 1722A West Anderson  
Loop, Austin, TX 78757;  
Tony Bermudez, (512) 458-2324



**Drycreek Raceway,** 5903 Co.  
Road 2297, Quinlan, TX 75474;  
Micky Alphin, (903) 883-4060



**Eastex Raceway,** 45000 Hwy. 59 N.,  
New Caney, TX 77357;  
Brent Mahaffy, (713) 399-9777



**Fasttrack Raceway,**  
301 Edith Drive, El Paso, TX 79924;  
Hector Gonzalez, fax (915) 779-4524



**Finish Line Raceway,** 2775 N. Hwy  
360, Suite 637, Grand Prairie, TX 75050; Steve Manning,  
(817) 652-3340



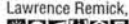
**Flip & Spin R/C,** 5957 Jones Rd.,  
Bryan, TX 77807; Garland Crabb,  
(409) 822-7311



**Hal's Hobby Raceway,**  
1440 Bessemer, El Paso, TX 79936;  
(915) 591-2213



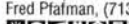
**The Hobby Center Raceway,**  
4104 Stan Schlueter Loop,  
Ste. 1, Killeen, TX 76543;  
Lawrence Remick, (817) 690-7311



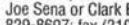
**Hobbycraft Speedway,**  
819 N. Main St., Corsicana, TX 75110; Keith Hoffman, (903) 872-6761



**Hobbytown USA,** 7676 FM 1960 W.,  
Houston, TX 77070;  
Fred Pfafman, (713) 955-7097



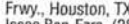
**Hobbytown USA,** 999 E. Basse Rd.,  
Suite 177, San Antonio, TX 78209;  
Joe Sena or Clark Baisdon, (210) 829-8697; fax (210) 829-8707



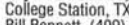
**Indy R/C World,** 220 Saturn Rd.,  
Garland, TX 75041; Steve Webster,  
(214) 271-4844; fax (214) 271-4502



**Issac's Race Track,** 18177 Gulf  
Frwy., Houston, TX 77598;  
Issac Ben-Ezra, (281) 488-8697



**Keyser's Hobbies,** 1643 Texas,  
College Station, TX 77840;  
Bill Bennett, (409) 693-8095



**MBRC Off-Road Raceway,**  
204 D&E Valley Lane, Kennedale, TX 76133; (817) 292-5055



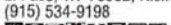
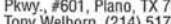
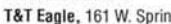
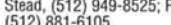
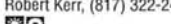
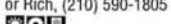
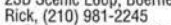
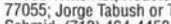
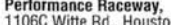
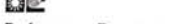
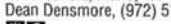
**Mike's Hobby Shop Superstore and  
Raceway,** 1605 Crescent Circle,  
Carrollton, TX 75006; (972) 242-4930;  
www.mikes hobbyshop.com



**North Houston Speedway,**  
11847 Spears Rd.,  
Houston, TX 77067; Bob or Carol  
Hill, (713) 872-2471



**North Texas 1/2 Scale Association,**  
3905 Sandia, Plano, TX 75023;  
Dean Densmore, (972) 519-0324



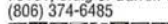
**Tiger's Den R/C Speedway,** 702 E.  
Broad St., Mansfield (DFW), TX 76063;  
Bob Burns, (817) 477-5513



**T.O. Offroad Raceway,**  
6236 Quail, El Paso, TX 79924;  
Efrén Saenz, (915) 821-7522



**Warehouse Radio Controlled  
Raceway,** 612 W 4th St., Amarillo, TX 79101; Craig or Darren Waddell,  
(806) 374-6485



**W.E.S. Hobby Race,**  
980 S. Fourth St., Beaumont, TX 77701;  
Edmond Richards, (409) 839-4929



**Wild Bill's Raceway,** 535 E. Shady  
Grove, Irving, TX 75060; Lynn Morgan  
or Tom Nix, (214) 438-9224

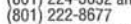


## UTAH

**Intermountain R/C Raceway,**  
8481 W. 2700 S., Magna, UT 84044;  
David Mott, (801) 250-8303



**Payson R/C Raceway,** 955 South  
Main, Payson, UT 84651; Gus Wood,  
(801) 224-3852 and Lasca Wood  
(801) 222-8677



**Vision Hobby,** 352 N. State St., Orem,  
UT 84057; Ken Rice, (801) 226-6226

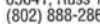


**WOR Raceway,**  
3170 Brinker Ave., Ogden, UT 84401;  
Brian Worton, (801) 393-2530



## VERMONT

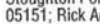
**Barre Town R/C Club,** 14 South Main  
St., Wall St. Complex, Barre, VT 05641; Russ Tribble or Pete Perreault,  
(802) 888-2860 or (802) 476-9458



**Bradford R/C Racing,**  
Main St., Bradford, VT 05033;  
Seth Bean, (802) 222-9674



**Stoughton Pond Raceway,**  
Stoughton Pond Rd., Perkinsville, VT 05151; Rick Adams, (802) 263-9321



## VIRGINIA

**Bob's Hobbies & Raceway,** 7422  
Brandy Creek Dr., Mechanicsville, VA 23111; Bob, (804) 746-2758



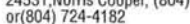
**Brad's Hobbies,** 1105 Greenville Ave.,  
Staunton, VA 24401;  
Brad, (540) 885-3642



**Brown Brothers Hobbies,** 924 North  
Main Street, Dumfries, VA 22026;  
Joel or Bob Brown, (703) 221-5746



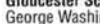
**Cooper's R/C Race Center,**  
4000 Sago Rd. (969), Chatham, VA 22431; Norris Cooper, (804) 724-7342  
or (804) 724-4182



**DRCW Raceway,** Debbie's RC World,  
2200 Commerce Parkway, Virginia  
Beach, VA 23454;  
Les Modlin, (757) 340-6681



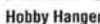
**Gloucester Scale Hobbies,** 2352  
George Washington Memorial  
Highway, Hayes Plaza, Hayes, VA 23072; Rob Thein, (804) 642-3484



**Hampton RC Speedway,** 1920 E.  
Pembroke Ave., Hampton, VA 23663;  
Mickey Kern, (757) 723-1884



**Hobby Hangers Speedway,** 14014 D  
Sullyfield Cir., Chantilly, VA 20151;  
Kwang or Billy, (703) 631-8820



**The Hobby House,** 116 Edds Ln.,  
Sterling, VA 20165;  
Oppie, (703) 444-0333



**K & W Hobby and Sports,** 5186 Nine  
Mile Road, Richmond, VA 23223;  
Ross Martin, (804) 737-3904



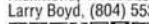
**KC's Radio Control & Repair,** Rt. 4,  
Box 312, Trents Ferry Rd., Lynchburg, VA 24503; Curtis or Kim Wright,  
(804) 384-8596



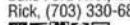
**Olde Towne Hobby Shoppe,** 9105 Center  
St., Manassas, VA 22110;  
Arnie Levine, (703) 369-1197



**Race World Hobbies,** 6102 Lakeside Ave.,  
Richmond, VA 23228;  
Larry Boyd, (804) 553-8040



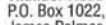
**Roadmasters/ Rick's Hobbies,** 12201  
Balls Ford Ave., Manassas, VA 22110;  
Rick, (703) 330-6833



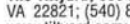
**Shamroc Raceway,** 106 Cheviot Place,  
Stephens City, VA 22655; Scott Janow,  
(540) 869-3551; Note: track is located in  
Winchester, VA



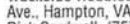
**Thunder Road RC Racing,**  
P.O. Box 1022, Troy, VA 22974-1022;  
James Palmer, (804) 589-8174



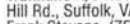
**The Tiltyard,** 6994 Tiltyard Drive, Dayton,  
VA 22821; (540) 828-3476  
www.tiltyard.com; tiltyard@rica.net



**Trackside Hobbies,** 1920 E. Pembroke  
Ave., Hampton, VA 23663;  
Rick Cardwell, (757) 723-4170

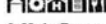


**Trainlano R/C Racing,** 5661 Shoulders  
Hill Rd., Suffolk, VA 23435;  
Frank Stevens, (757) 488-5454



## WASHINGTON

**Alfie's,** 108 South K St., Aberdeen,  
WA 98520; (360) 533-6638



**A-Main Raceway,** 14011 NE 3rd Ct.,  
Vancouver, WA 98685;  
Monty Coleman, (360) 571-8404



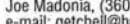
**Burien Toyota R/C,** 15025 1st Ave. South,  
Seattle, WA 98148



**C&C Raceway,** 266 Lind Ave. NW,  
Revlon, WA 98055;  
Charles Lakin, (206) 227-5167



**Cedardale Raceway,** 1673 Cedardale Road,  
Mount Vernon, WA 98273;  
Joe Madonia, (360) 659-0072;  
e-mail: getchell@halcyon.com



**Four Season R/C Racing,**  
2941 Sleater Kinney Rd. NE,  
Olympia, WA 98506; Gary and Sharon  
Brown, (360) 491-2430



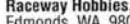
**Hale's R/C Raceway Park,** 10611 136th  
St. E. Puyallup, WA 98374; Walt Hale,  
(206) 845-7675



**Hannegan Speedway,** 4212 Hannegan  
Rd., Bellingham, WA 98225;  
Dana Hoggarth, (360) 734-4090



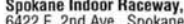
**Raceway Hobbies,** 188 Sunset Ave. S.,  
Edmonds, WA 98020;  
Brian Bodine, (425) 774-3285



**Schmidt's Auto Parts,** 10305 Old  
Hwy. 99, Marysville, WA 98271;  
Jon Failla, (206) 653-8838



**Spokane Indoor Raceway,**  
6422 E. 2nd Ave., Spokane, WA 99212;  
Dave Mapston, (509) 534-RACE



**Tacoma R/C Raceway,**  
6305 6th Ave., Tacoma, WA 98406;  
Scott Brown, (206) 565-1935



**Tearor Raceway, Fantasy  
World Toy and Hobby,**  
7901 S. Hosmer, Tacoma, WA 98408;  
Dave Kleinman, (206) 473-6223



**Ultimate R/C Raceway,**  
907 Cole St. #3, Enumclaw, WA 98022;  
Dan Daugherty, (360) 8



## AUSTRALIA

**A.C.T. Model Car Racing Club**, offroad track—Wanniasa Raceway, Hyland Place, Wanniasa A.C.T.; indoor track—Epic Complex, Northbourne Ave., Canberra North A.C.T.; Gary Davey, 61-6-2871411



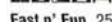
**Aubry R/C Car Club**, Aubry Showgrounds, Aubry, NSW 2640; Ron Langman, 060-247-128



**Canberra Off-Road Model Car Club**, Goyder St., Narrabundah, ACT 2604; Graham Brown, 61-6-241-3070



**Central Coast ORCC**, EDSACC Sports Complex, Bateau Bay, N.S.W. Australia 2261; Peter J. Knight, 61-43-693-698



**Fast n' Fun**, 250 Potreath Rd., Belbrae West, Torquay, VIC 3228 Australia; Stephen Chica, (613) 5266 1550 or (613) 5266 1556; fax (613) 5266 1556



**Illawarra RCECC**, Croome Sporting Complex, Albion Park Rail, NSW 2527; Mel or Andrew, 042-714-683



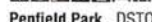
**Lakeside R/C Racing Car Club**, Hollywood Dr., Lansvale, NSW 2166; R. Bartolozzi, 62-2-907-9800



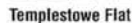
**Melton Electric Circuit Car Association**, Safeway Car Park, Corner High St. and Coburns Rd., Melton, VIC 3337; Arthur Joslin, 61-3-9747-8805



**Northern Districts Model Rally Club, Inc.**, Rear Stanford Centre, 16 Stanford Way, Malaga, Western Australia 6066; G. Thirillwell, 61 (9) 249 3855; fax 61 (9) 249 4778; email tony@ois.com.au



**Penfield Park**, DSTO Complex Salisbury, Adelaide, South Australia 5108; Trevor Unsworth, (618) 8289-5010



**Templestowe Flat Track Racers**, Templestowe Reserve, Corner of Porter St. and Williams Rd., Templestowe, Melbourne, Victoria 31066; Renato Benci, 61 (3) 9553 4625

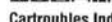


**Wodonga R/C Car Club**, 11 Murphy St., Wodonga, VIC 3690; Ron Langman, 61-60-247-128



## BELGIUM

**ATR-Alka-Tele-Racing**, 3570 Stationstraat 21, Alken Limburg; 0032-11-25-49-03



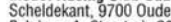
**Cartroubles Indoor Buggy Track**, Jan Moonsstraat 52-56, 2160 Wommelgem, Belgium; Guy Ermes, 32-3-326-51-15; fax 32-3-326-51-01



**MBV-Kampenhout**, Teniersin 28, Kampenhout 81910, Belgium; Frank Mostrey, phone and fax 0-16-65-75-18



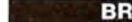
**MRCZ**, Centrum, De Burg, Belgium; Montie, 75-71-63



**Model Racing Club Oudenaarde**, Scheldekant, 9700 Oudenaarde, Belgium; A. Chanterle, 32-55-31-36-48; fax 32-55-30-19-12



**R.C.R.**, Peilstraat 43, Retie 2470, Belgium; A. Eelen, phone and fax 32-14-379685



## BRAZIL

**Amoc Cassioçao de Modelismo B. Cambario**, Junto ao Par Que Ecológico de Bal. Cambario, Bal. Cambario, S.C. 88.330-000; Leo Cesar, (047) 366-0001



**Brasília R/C Motor Circuit**, Estacionamento do Estádio Mane Garrincha, Brasília, DF 70000, Brazil; Alexandre (Alex), 55-061-273-7205



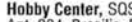
**C.A.A.R. Curitiba Associacao de Autodelismo Radiocontrolado**, Rua Theodoro Makioka, n 2300 Santa Candida, Curitiba, PR Brazil, 82650-530; Ronaldo Assumpcao, 55-41-354-2804



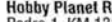
**Electric Car Club R/C Santos**, Av. Bernardino de Campos, 227, Santos, SP, Brazil, 11065-001; Estevam or Arnaldo, 55-013-232-2536



**Hamilton Neto Associaca RC**, Rua Uterere 259, Curitiba, Parana Brazil 80380-400; Danico Pilhax, 55-41-338-8041; hammer\_usa@hotmail.com



**Hobby Center**, SOS.210 B.H. Apt. 204, Brasília, DF-Brasil 70.273; 061-242-0488



**Hobby Planet Racing Club**, Rod Dom Pedro 1, KM 1315, Campinas, Sao Paulo, Brasil 13091901; Daniel, Helio, Luciano, 019 258 2768



**Jungle Drive**, Rua Alberto Maranhao, No. 219 Icha do Gov, Rio de Janeiro, 21940-490; Paulo Brito (021) 396-0851 or (021) 393-7449



**MP Raceway**, AV. Nacoes Unidas, 6815 Lapa, Sao Paulo; Gerd Heitrotter, 55-11-9819039; www.hpraceway.com.br



**Off Roaders**, Av. Guillerme Dumont Villars, 317, Sao Paulo, CEP 05640; Waldir Ielpo, (055) 011-260-5628; fax (055) 011-831-4931



**Way of R/C Off-Road Cerrado**, Rua Paraiba 1323, 1st floor, Belo Horizonte, Minas Gerais; Claudio T. Corrêa, (031) 227-6111, fax (031) 227-6869



## CANADA

**Action Weelz**, 462 Turcotte, Vanier, Quebec, G1M 1R6; Regent Tardif, (418) 527-5756



**Advance R/C Raceway**, 4181 Sheppard Ave. E, Scarborough, Ontario M1S 1T3; Albert Lau, (416) 321-8377



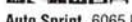
**A&J Toronto R/C Raceway**, 24 Main St., Building B, Unionville, Ontario L3R 2E4; (905) 305-1479



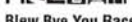
**The All New R.C. World**, 2633 Hwy. #6, Mt. Hope, Hamilton, Ontario L0R 1W0; Dave, (905) 765-2301, Larry, (905) 333-3297 or Brian, (519) 752-0044



**ATN**, Auto Teleguidee Nicolet, 2000 Rue Paul Hubert, Saint-Jean-Baptiste-de-Nicolet, Quebec J3T 1E5; Louis Durand, (819) 293-6097



**Auto Sprint**, 6065 Des Grands Prairies, St. Leonard, Quebec H3G 2R6; David Kalayjian, (514) 287-3503



**Blew Bye You Raceway**, 134 Dike Rd., Chilliwack, British Columbia, V2P 5B1; (604) 792-8978



**Circuit J.C.**, 1283 Chemin St. Philippe, St Polycarpe, Quebec J0P 1X0; Jean Castellon, (514) 265-3675



**Circuit Pepsi**, Centre de Location, 37 du Roi, Sorel, Quebec; (514) 746-8828



**Circuit Plessis**, 260 Rang 9 Ouest, Plessisville, Quebec G6L-2Y2; (819) 362-3743



**Circuit R/C Pro**, 1500 Chemin Sullivan, Val d'Or, Quebec J9P 1M1; R/C Modeler Plus, (819) 874-3918



**Circuit Teleguide St. Roch**, 363-B St. Charles, St. Roch De L'Acadie, Quebec J0K 3H0; (514) 588-4254, fax (514) 588-6554



**Circuit Teleguide Grand Prix II**, 701, Sainte-Rose, Ste. 200, Laprairie, Quebec, J5R 1Z2; (450) 444-1286



**Club Auto Teleguides**, 1750Mlee Interprovince, C.P. 35, Pointe-Fortune, Quebec, J0P1N0; Jacques St. Alexis, (514) 451-0078



**Club Avatt**, 244Jules-Richard, Deauville, Quebec J1N 3; Daniel Vanier, (819) 864-6262



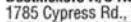
**Club RCSI**, 44 Rue Holiday, Sept-Iles, Quebec G4R; Sylvio Gerard, (418) 968-6575; Hobby Shop, (418) 962-6565



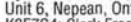
**CRCCC**, Box 309, Clinton, Ontario N0M 1L0; Eric Russell, (519) 482-9429



**CTG**, 450 Chemin de la Grand Ligne, Granby, Quebec; (514) 358-4419



**CTL**, 495 Industriel, Longueuil, Quebec; (514) 358-4419



**Dustkickers R/C Raceway**, 1785 Cypress Rd., Quesnel, British Columbia V2J 4B1; Darrell Dinsdale, (250) 747-2680



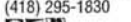
**Dynamic Hobbies**, 21 Concourse Gate, Unit 6, Nepean, Ontario, K2E7S4; Clark Freeman, (613) 225-9634



**East Coast Model Center Raceway**, 13 Glen Stewart Dr., Ste 1, Southport, Prince Edward Island C1A 8X9 Gary Stephen, (902) 569-3262



**Fast-Trax Speedway**, RR 4, Trenton, Ontario; Russ McPeak, (613) 394-6411



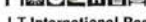
**Fly'n Bryan's Radical Raceway & Little Shop of Hobbies**, RR #1, Ste. 12, Comp. 49, Chase, British Columbia, Canada V0E 1M0; Bryan Coffey/ Dani Potvin, (604) 955-0669



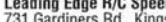
**Gilles Comtois**, 1458, boul. Lafleche, Baie-Comeau, Quebec, G5C 1E1; (418) 295-1830



**Hobby 2000**, 75 St-Jean-Baptiste, Suite 140, Chateauguay, Quebec, Canada J6J 3H6; Hugues-Andre Meloche, (450) 698-2000



**Interior R/C Raceway**, 34-1605 Summit Dr., Kamloops, BC, V2E 2A5; Martin Vannieuwenhuizen, (604) 374-1268 or (604) 374-8458



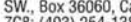
**J-T International Raceway**, 127 Milligan Lane, Nanapanee, Ontario K7R 8A1; N. O'Neill, (613) 354-0099



**Leading Edge R/C Speedway**, 731 Gardiners Rd., Kingston, Ontario K7M 3Y5, Canada; Mike and Tony Daica, (613) 389-4878



**Mid-Canada R/C Speedway**, 1678 St. James St., Winnipeg, Manitoba R3H 0L3; Richard Driedger, (204) 339-6566



**Miniatures & Passions**, 204 St. Charles, #103, Ste. Therese, Quebec, Canada J7E 2 B4; Gilles Lachance, (514) 979-7989



**MORRAC Raceway**, 6449 Crowchild Tr. SW., Box 36606, Calgary, Alberta T3E 7C8; (403) 254-1386



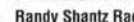
**Off-Road R/C Raceway**, 76 Eddystone Ave., North York, Ontario M3N-1H4; Ron Lefebvre, (416) 740-0536



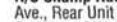
**Prince George Radio Controlled Car Club**, 202 Explorer Cres., Prince George, B.C. Y2M5R8; Doug Waller, (604) 561-0035



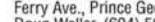
**Quintrax Speedway**, 610 Dundas St. East, Belleville, Ontario K7K 2M1; (613) 962-1414; fax (613) 962-7306



**Randy Shantz Raceway**, 1015 W. 14th St., North Vancouver, British Columbia; Steve Mulhall, (604) 945-3888



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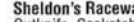
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**Ronbo's R/C Racing**, RR 1 Glen Walter, Cornwall, Ontario K6H 3G4 Ron Giroux, (613) 936-0176



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**South Muskoka R.C. Track & Mini**, Putt, 8903 Hwy 11, Orillia, Ontario L3V 6H3; Justin Fortin, (705) 329-0397



**Spinnin Wheel Raceway**, RR 1, Ariss, Ontario N0B 1B0; (519) 824-1614



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**Garoso Raceway**, Avenida Libertadores con Diagonal Gran Colombia, Cucuta, Colombia; Gabriel Rodriguez, 975-751892



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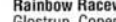
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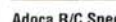
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**Rainbow Raceway**, Eriksvej 9 Glostrup, Copenhagen 2600; P. Christiansen, 45-52-848-504



**Thor Minirace Odense**, Sohusevej 255, Allesø, Odense, Behind Alesso Hallen (Sport Centre), Odense, Denmark; Ulrich Rasmussen, 45-65-303-707



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**La Barranquilla R/C International Speedway**, Santiago; (809) 582-2303



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**Panik Raceway**, Teutonen Str. 5, Troisdorf, Germany 53844; Guido Kraft, 0224-400259



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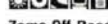


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**Yokota R/C Racers**, PSC #78, Box 4274 APO AP 96326, Tokyo, Japan; Brad Johnson, 011-813-11-757-7655



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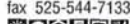
**Alces Off Road**, Lopez Mateos y Rayod S/N, Ensenada, Baja California, BC 22830; Jorge Bustamante, 667-6-1476, 61477, 86729



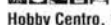
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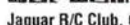
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**Hobby's Formula**, Av. observatorio 457 DF 01120; 905-502-3620



**Hobby Model's Raceway**, Blvd. Garcia de Leon, 1555, Morelia, Michoacan 58260; 431-5-01-22



**Jaguar R/C Club**, Calz. Zavaleta 116, Puebla 72150; Cherna, Denise or Chiro, 22-31-00-91, 22-33-00-94



**La Hielera**, Prol Corregidora Nte 350, Queretaro, QRO C.P. 76160; Jorge Morelos Rabell, 42-12-15-25



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**R/C Racing Club**, Obsidiana #2900, Zapopan, Jalisco 44560; Fernando Hernandez, 3-616-73-47



**Tony's Track**, Obregon 364 Sur, Culicán Sinaloa; Guillermo Prieto, 67-165708-168141



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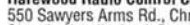
**Capital Model Racers**, Avalon, Lower Hutt, New Zealand; Roger Whitmarsh, 04-566-5714



**Counties R/C Raceway**, Pukekohe Showgrounds, Station Rd., Pukekohe, New Zealand; R. Northcott, 09-23-86904



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**Hadeland Raceway**, 2750 Gran, Gran Norway; Dag Bakke-Nilsen, 61330405



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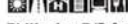


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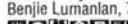
**Philippine F1/Touring Club**, Super Mall I, EDSA, Quezon City 1156; Raymond Aguilar/Ron Villafior, 896-64-15/23-30-08



**Philippine R/C Association**, B.F. Homes Paranaque, Metro Manila 1700; Ronald/Manny Villafior, 23-30-08

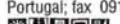


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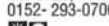
**Pick 'n' Pay Model Car Club**, P.O. Box 11654, Klerksdorp 2570; H. Grobbs, (27) 18 46245421



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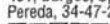
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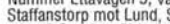
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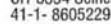


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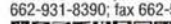


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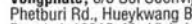


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